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FOREWORD

This document is provided by Space Information Systems Operation (SISO) in accordance with the requirements of Task Order (TO) P-2F00 as established under modification No. 195 of contract NAS 9-1261, Schedule V.

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SECTION 1

INTRODUCTION

1.1 PURPOSE

The purpose of this document will be to delineate the detailed program documentation for Computer Output Microfilm System A in Bldg. 30, NASA JSC (COMA).

1.2 SCOPE

Paragraph 1.3 of this document delineates the applicable documents which apply to this system. Paragraph 1.4 provides an overall view of the system and describes the functional relationship between the system software (described in SISO-TR531, Vol. I), the standard insert routines (described in SISO-TR531, Vol. I), and the applications programs (described in section 2 of this volume). Appendix A contains instructions for locating those documents delineated in paragraph 1.3. Appendix B contains Test Preparation Sheets, NASA JSC Form 1225, for all baseline and/or program modification acceptance tests. The documentation for each of the application programs (section 2) consists of the following major headings:

2.X TITLE OF PROGRAM

2.X.1 <u>Background</u>

A. Author

B. Intent

C. Program History

2.X.2 <u>Introduction</u>

2.X.2.1 <u>Hardware Requirements</u>

2.X.2.2 <u>Software Requirements</u>

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1.3 APPLICABLE DOCUMENTS

The following documents, of the latest issue in effect, are applicable as specified herein.

1.3.1 Requirements Specifications

- PHO-TN598 - FR80 Gray Level Processing Requirements Specification
- SH-09607A - COM System Data Processing Requirements Specification
- SH-09832 - FR80 Skylab Solar Experiment S055 Processing Requirements Specification
- SH-09846 - Computer Output Microfilm System A (COMA) Univac 494 Print Processing Requirements Specification

- SH-25703 - Computer Output Microfilm System A PDP Print Processing Requirements Specification
- SH-25722 - FR80 Harvard College Observatory Solar Experiment S055 Processing Requirements Specification
- SH-25752 - Computer Output Microfilm System Varian 73 Print Processing Requirements Specifications
- SH-25812 - Computer Output Microfilm System A Large Area Crop Inventory Experiment Software Requirements Specification.

1.3.2 Test Specifications

- PHO-TN605 - FR80 Gray Level Test Tape Requirements Specifications
- SH-09606A - COM System Test Tape Requirements Specification
- SH-09833 - Skylab Solar Experiment S055 Test Tape Requirements Specification
- SH-09851 - Computer Output Microfilm System A Univac 494 Print Processing Test Tape Requirements Specification
- SH-25713 - Computer Output Microfilm System A PDP Test Tape Requirements Specification
- SH-25723 - FR80 Harvard College Observatory Solar Experiment S055 Test Tape Requirements Specification
- SH-25769 - Computer Output Microfilm System A Varian 73 Print Processing Test Tape Requirements Specification.

1.3.3 Acceptance Test Procedure

SB-09613A - COM System Acceptance Test Procedure.

1.4 OVERVIEW

The Computer Output Microfilm System consists of a series of programs which converts digital data from magnetic tapes into alphanumeric characters, graphic plots, and imagery that is recorded on the face of a cathode-ray tube. A special camera photographs the face of the tube on microfilm for subsequent display on a film reader. The software which is used to accomplish this is divided into three distinct categories:

- Systems software (SISO-TR531, Vol. I)
- Standard insert routines (SISO-TR531, Vol. I)
- Applications software (section 2).

The systems software consists of the assembler and various utility programs. The assembler is a two-pass macro-assembler. The utility programs include the Text Editor, Tape Dump Reloader, Disk Dumper, Magnetic Tape Display, and Disk Audit Programs.

The standard insert routines are used in each of the application programs. They include the operating monitor, vector routines, character sets, character routines, magnetic tape routines and film advance routines.

Applications software has been developed for processing of print, graphic and imagery data tapes for the following systems:

- IBM 360/75
- Univac 494
- Varian 73
- PDP 11/45
- Digital television equipment 36- and 48-bit data format
- Harvard College Observatory (HCO) Solar Experiment S055
- Large Area Crop Inventory Experiment (LACIE) print data.

SECTION 2

APPLICATION PROGRAMS

The application programs that follow have been developed on the COM System to process print, graphic, and image data from 7- or 9-track magnetic tapes to be output to 16 mm microfilm or 105 mm microfiche.

Information pertaining to control codes, character sets, input formats, output formats, etc. for each individual program can be found in that program's software requirements specification in Appendix A.

2.1 COMA DTE PROCESSORS FOR 16 mm FILM (16DT36, 16DT48) AND 105 mm FICHE (105DT6, 105DT8)

2.1.1 Background

A. Author. W. T. Jackson, Aeronutronic Ford Corporation.

B. Intent. The DTE Processors process 9-track magnetic tapes formatted in 36-bit and/or 48-bit digital television equipment (DTE) language as delineated in SH-09607A.

   1. 16DT36 processes 9-track magnetic tapes formatted in 36-bit DTE on 16 mm microfilm.

   2. 16DT48 processes 9-track magnetic tapes formatted in 48-bit DTE on 16 mm microfilm.

   3. 105DT6 processes 9-track magnetic tapes formatted in 36-bit DTE on 105 mm microfiche.

   4. 105DT8 processes 9-track magnetic tapes formatted in 48-bit DTE on 105 mm microfiche.

C. Program History

   1. Production Tape Date. TBP

   2. Author. W. T. Jackson

3. Authorization. EO-005F

4. Test Case. Acceptance test procedure SB-09613A

5. Revisions. Reference Appendix B, paragraph B.1.

2.1.2 Introduction

2.1.2.1 Hardware Requirements

- FR80 with 12K memory
- 9-track magnetic tape unit
- 16 mm unsprocketed camera
- 105 mm camera

2.1.2.2 Software Requirements

The following files, found in I.I.I.'s SYM Directory, are required.

III109	III164 Film	III161 GO
III166	III163	III187
III164	III147	FLOAD
III162	III161	
III185	III186	

2.1.2.3 Assembly Parameters

The assembly parameters in III109 shall be set for the proper machine configuration. Assembly parameters specific to the DTE processors are as follows.

A. CAMNUM. If 2, indicates 16 mm unsprocketed camera; if 7, indicates 105 mm microfiche camera.

B. TWOBUF. If 1, indicates two magnetic tape buffers for higher throughput.

C. BIGBUF. If 0, allows maximum amount of operator functions with minimum buffer space.

D. DASHED. If 1, assembles code for generation of dashed vectors.

E. CIRCLE. If 1, assembles code for generation of circles and arcs.

F. LOCASE. Lower case character set required.

G. EBCDIC. Entire EBCDIC character set required.

H. 7TRACK. If 0, 7-track magnetic tape handler not required.

I. 9TRACK. If 1, 9-track magnetic tape handler is required.

J. PTYPE = 3. EBCDIC forms loader.

K. MUMBLE. If 1, defines system configuration output via teletype during assembly.

L. FONT. If 0, assembles standard III character font.

M. TAPELB. If 1, defines code to provide processing of IBM standard tape labels.

N. DTE. If 1, defines code specifically for the 36-bit DTE processors.

O. NASA. If 1, assemble NASA specific character set.

P. D48. If 1, defines code specifically for the 48-bit DTE processors.

Q. ALLOW. Defines code to allow form loading and processing.

R. FTYPE. If 105, defines code for generation of 105 mm microfiche.

S. MANYUP. If 1, defines code for multiple images per frame for 105 mm microfiche.

2.1.2.4 Operator Commands

A. The following commands are available for use with either the 16DT36 or 16DT48 Program.

TIME

FRAME

STRIP CHART

GO

CONTINUE

CLEAR

REWIND

SKIP

TRY AGAIN

STANDARD LABELS

UNLABELED

FOCUS

PULLDOWN

ROTATED

UPRIGHT

SETSIZE, PULL DOWN

B. The following commands are available for use with either the 105DT6 or 105DT8 Program.

TIME

FRAME

GO

CONTINUE

TITLE

END JOB

CLEAR

REWIND

SKIP

TRY AGAIN

STANDARD LABELS

UNLABELED

FORM

INDEX FORM

2.1.3 Analysis

2.1.3.1 Major Control Section

A. Description. Upon issuance of a GO command by the operator via the console teletype, the III routine PSTART transfers control to the DTE processing routine BEGIN. BEGIN initializes all switches, does initial camera advancing and positioning using the III routines FC7CLR, FRSPIC, and NEXPIC, determines the location and size of the data input buffer, calculates the X and Y scaling factors for centering the image in the 16K by 16K area, and transfers control to GETCOM.

GETCOM initializes parameters to access a DTE data word and transfers control to BITCNT. BITCNT, using the III routine MTBYTE, accesses the number of data bits requested by GETCOM and transfers control to GETOP with the data bits in the AC (up to 18 bits per access).

When a magnetic tape read is initiated, and it is the initial read for a job, a test is made by BITCNT for COM controls. If COM controls are not present, the data is ignored and the next data record is accessed. This procedure is repeated until the first COM control record is read. When the first COM control record is accessed, BITCNT checks for an S, T, F or I identifier in the second byte of the record. When processing 16 mm, all COM control records are skipped, with control being passed to CUTMAK for output of cutmarks. Film is advanced to the next frame via NEXPIC, and control returns to BITCNT. When processing 105 mm and the identifier is an S or T, the record is moved to the buffer TITARE for output via the III routine FICTAP. When the identifier is an F, DTFORM switch is set for forms overlay processing and a check is made to determine if indexing is requested. If so, INXSSW is set, the position and number of characters for indexing is set, and control is returned to BITCNT. All records following the first COM control record are either 1) ignored for 105 mm processing until a second COM control record is accessed, or 2) processed by PROC76 as EBCDIC data, for 16 mm recording, until a second COM control record is accessed. BITCNT processes the second COM control record in the same manner as the first and transfers control to GETOP for processing of DTE data. When an EOF is accessed, the job is complete and control is returned to the operator. GETOP determines from the DTE op code the type of DTE data word to be processed. The following paragraphs delineate the processing done for each type of DTE data word.

When the DTE word is a command, GETOP transfers control to ENDLN. ENDLN does a check to determine if the word is a jump. When the word is not a jump, it is ignored and control is returned to GETCOM. When the word is a jump, control is transferred to NEXFRM for output of forms overlay or cutmarks and advance to next frame via NEXPIC. If the strip charting option has been selected, the cutmark output will be inhibited. Control is then returned to GETCOM.

When the DTE word is a vector, the X_1Y_1 and X_2Y_2 coordinates are calculated and placed in XHD, YHD, XTL, and YTL. Control is transferred to MAP, which scales the heads and tails to the image size specified by DFRSZ. The X and Y DAC's are set via SETXYS, the vector is output by DRWVEC, and control returned to GETCOM.

When a START PRINT word is accessed, TYPSW (the typewriter switch) is set to allow processing of typewriter words. The character and character size are then masked from the START PRINT word and used to calculate the corresponding FR80 character and character size. This size is used for all characters until changed by another START PRINT word. The INXSSW switch is checked, and if it is set, the X and Y coordinates of the START PRINT word are checked against those found in the form and index control record. When the coordinates do not match, control is transferred to NOINDX. When the coordinates match, control is transferred to STARTX. STARTX sets the STOCSW switch, which causes the next n-1 typewriter characters (n = number of characters specified in the index record) to be stored as the index record entry for this frame, sets the appropriate counters for storing the index data, and transfers control to NOINDX. NOINDX scales the X and Y start print coordinates to the FR80 image size via MAP, sets the X and Y DAC's using the III routine SETXYS, and outputs the START PRINT character via CHROUT. Control is then returned to GETCOM.

When the DTE word is TYPEWRITER, the typewriter switch (TYPSW) is checked. When TYPSW is not set, the system halts (i.e., no previous START PRINT word to give coordinates). When TYPSW is set, then each character of the typewriter word is output via CHROUT. CHROUT converts each DTE character to the appropriate FR80 character code and size, stores each character in the index field if the STOCSW (save index) switch is set, and outputs the character using the III routine VCHAR. When the last character of the typewriter word is processed, control is returned to GETCOM.

B. Input/Output

1. Input. Data input via 9-track magnetic tape consists of DTE 36- or 48-bit command, instruction, and data words, and COM control records. All input data tapes are recorded in a variable spanned length record format (blocked or unblocked). Detailed descriptions of the format(s) and data content of the magnetic data tapes are found in SH-09607A.

2. Output. Data is output to either 16 mm or 105 mm film. Each frame contains one DTE image. Data frames on 16 mm film may be abutted by utilization of the STRIP CHART operator command.

C. Linkages

1. External

Routine	Program
FC7CLR	III166
FRSPIC	III166
MNBRIT	III166
NEXPIC	III166
MTRINI	III163
KYBLIS	III166
GET	III163
SETXYS	III162
SETHD	III162
SETTL	III162
DRWVEC	III162
PSTLL	III166
SETPLS	III166
VCHAR	III147
INXDO	III166
MTBYTE	III163
FICTAP	III186
ROTATE	III166
MDONEX	III166
FCFIN	III166
FLASH	III187

2. Internal Routines

GETCOM	CHROUT	CCNTRL	SAVADD
GETOP	STOCH	SEPREC	RESTOR
GETCR	ENDLN	PROC76	RETRN
TYPSW	CONVRT	SPACE3	RESET
TYPLP	NEXFRM	TITREC	NEWSEG
TYPNL	DTFLSH	FRMREC	NMGET
TYPMA	BITCNT	ROTREC	NMGET1

TYPCR	GETSEG	IGNORE	EBGET
SETCR	GETSG1	IGNOR1	MVCOM
NOINDX	GETSG2	CUTMAK	MAP
STARTX	GETBLK	MVOVER	SCAL

2.1.3.2 Subroutines

A. BITCNT. Entered with the AC containing the number of bits to be accessed. Uses MTBYTE to get bits requested, returning to the calling routine with the bits requested in the AC. Calling sequence:

```
LAC N (1≤N≤18)
JMS BITCNT
```

B. CCNTRL. Accesses eight-bit carriage control characters via GET and checks for COM control indicator; if there is not a COM control character, exits by CCNTRL. If there is, checks next byte for legitimate COM control function and branches to proper handler. Calling sequence: JMS CCNTRL

C. CHROUT. Entered with the AC containing a character to be output. Converts character to EBCDIC via CONVRT, outputs character via VCHAR, and returns control to calling routine. Calling sequence where N = eight-bit control character:

```
LAC N
CHROUT
```

D. CONVRT. Entered with DTE character in AC. Character is converted to EBCDIC via DTETAB table. Exit is to calling routine with converted character in AC. Calling sequence where N = DTE character:

```
LAC N
JMS CONVRT
```

E. CUTMAK. Routine utilized for 16 mm microfilm processing only. Called once per frame for output of three marks, four vectors in width, the position and size of which are delineated by MRKTOP, MRKBOT, MRKLFT, SDELTA, MDELTA, MARKS, and STROKS. Returns control to call routine. Calling sequence: JMS CUTMAK

F. DTESZ. Loads set size and pulldown as input from the TTY. Also sets scaling parameters for frame. Exits via MDONEX. Called via MONTOR.

G. DTFLSH. Builds and outputs DTE 1024 × 1024 forms overlay scaled to FR80 frame size via MAP. Output and coordinate positioning are controlled by DRWVEC, SETTL, and SETHD III routines. Exits to calling routine. Calling sequence: DTFLSH

H. EBGET. Converts EBCDIC numeric string, whose length is specified in SETXYS, to decimal. Numbers are accessed from magnetic tape via GET. Converted number is in AC on exit to calling routine. Calling sequence where N = length of numeric string:

```
LAM N
DAC SETXYS
JMS MVCOM
```

I. EJECT. Advances to next frame and outputs cutmark if required; resets X and Y page positioning, character deltas (CHDELX, CHDELY), and character size (CHRSIZ) via SETXYS and SETPLS. Outputs EBCDIC data via NEXTCH until next carriage control character is accessed, whereby BITCNT transfers control to the proper routine. Calling sequence: JMP EJECT

J. ENDLN. Checks command word for JUMP. If there is a JUMP, advances to next frame via NEXFRM and gets next DTE data word. If there is not a JUMP, data is ignored and next DTE data word is accessed. Control is transferred to GETCOM. Calling sequence: JMS ENDLN

K. FRMREC. For 105 mm film processing, sets DTFORM switch for overlay processing, accesses and sets control functions for indexing, and transfers control to IGNOR1. For 16 mm, advances film via NEXPIC, outputs cutmarks if strip charting is inhibited, and transfers control to IGNOR1. Called in CCNTRL upon decode of F type COM control record. Calling sequence: JMP FRMREC

L. GETBLK. Accesses 32 bits of data from magnetic tape via MTBYTE. Used to read record block and mask off block discriptor word (BDW). Exits to calling routine. Calling sequence: JMS GETBLK

M. GETCOM . For 36-bit DTE words, bit bucket four-bit pad, calls KYBLIS for operator interrupt processing, transfers control to GETOP. GETCOM is called for all DTE data word decodes. Calling sequence: JMP GETCOM

N. GETCR. Determines if 36-bit DTE word is a typewriter or a START PRINT word. Control is transferred to TYPSW or SETCR, respectively. Calling sequence: JMP GETCR

O. GETOP. Gets four-bit op code and determines if data word is a command or vector word. If it is neither, control is transferred to GETCR. If it is a command, control is transferred to ENDLN. Calling sequence: JMP GETOP

P. GETSEG. Gets logical record segment from tape input area. Determines segment control code, segment length, and carriage control from segment descriptor word (SDW). If the segment length is two or less, control is returned to GETSEG+1 for the next logical record segment. If the segment control code is 0 or 1, which specifies a COM control record, CCNTRL is called for processing of the COM control record. Upon return from CCNTRL, control is transferred to the calling routine. Calling sequence: JMS GETSEG

Q. IGNORE. Remains in loop ignoring data via BITCNT until next COM control record or logical segment is read, with control being transferred to the applicable routine by BITCNT.

R. <u>IGNOR1</u>. Sets applicable switches to remain within GETSEG routine until DTE data has been accessed.

S. <u>MAP</u>. Sets XHD, YHD, XTL and YTL DTE vector coordinates scaled to FR80 units. Coordinates are centered in 16K × 16K frame with XHD, YHD, XTL, YTL containing DTE vector coordinates. Returns to calling routine with XHD, YHD, XTL, YTL containing FR80 coordinates. Calling sequence: MAP

T. <u>MVCOM</u>. Transfers COM control data, as specified in the S or T record, into either buffer TITARE for 105 mm or MTTARE for 16 mm. Data is accessed from tape buffer one byte per access via GET with AC containing first titling character. Calling sequence: JMS MVCOM

U. <u>MVOVER</u>. Sets X and Y DAC's plus XHEAD's and YTAIL's for cutmark vectors. VHEADX = start point X_1, VHEADY = start point Y_1, VTAILX = end point X_2, and VTAILY = end point Y_2. Calling sequence: JMS MVOVER

V. <u>NEWSEG</u>. Reads in new logical segment; gets bits requested from old and new segment and returns to calling routine with data in AC. Calling sequence: JMP NEWSEG

W. <u>NEXFRM</u>. Outputs forms overlay, if requested. If 105 mm, sets titling intensity, advances to next frame, resets intensity, and exits to calling routine. If 16 mm, advances to next frame, outputs cutmarks if strip charting inhibited, and exits to calling routine. Calling sequence: NEXFRM

X. <u>NMGET</u>. Sets counter to get converted four-digit hexadecimal number via EBGET. Returns to calling routine with value in AC. Calling sequence: JMS NMGET

Y. <u>NMGET1</u>. Sets counter to get converted two-digit hexadecimal number via EBGET. Returns to calling routine with value in AC. Calling sequence: JMS NMGET1

Z. NOINDX. Entered with XHD and YHD containing DTE character coordinates and CHTEM containing eight-bit DTE character. Scales coordinates to FR80 units, sets X and Y DAC's, outputs character, and transfers control to GETCOM. Calling sequence: JMP NOINDX

AA. PROC76. Entered with AC containing an EBCDIC carriage control other than SKIP to Channel 11. Outputs EBCDIC data via NEXTCH until COM control indicator is accessed, whereby control is transferred to BITCNT. EBCDIC carriage controls are interpreted by SPACE3 and EJECT. Calling sequence: JMP PROC76

BB. RESET. Sets switches specifying COM control; sets return address in GETSEG and BITCNT to return to calling routine. Calling sequence: JMS RESET

CC. RESTOR. Restores BITCNT and GETSEG parameters to condition previous to COM control loop. Calling sequence: RESTOR

DD. RETRN. Saves return address from BITCNT for original call. This is done prior to COM control processing. Calling sequence: JMS RETRN

EE. ROTREC. Decodes image rotation control record and sets image rotation via ROTATE. If 16 mm, advances to next frame and outputs cutmark, if applicable. Control is transferred to IGNOR1. Calling sequence: JMP ROTREC

FF. SAVADD. Saves BITCNT and GETSEG return addresses prior to COM control loop. Calling sequence: SAVADD

GG. SCAL. Entered with AC containing DTE coordinate. Exits to calling routine with AC containing coordinate in FR80 units. Calling sequence:

```
LAC N  1≤N≤1023
SCAL
```

HH. SEPREC. Entered with AC containing first character of S record. Calls MVCOM, initializes for no forms or indexing, and if 105 mm, calls FICTAP for control record processing. Sets CH11SW and SEGSW for control record skip via BITCNT and if 16 mm, sets CCNTRL routine for processing of 76-record EBCDIC identification. Exits to IGNORE. Calling sequence: JMP SEPREC

II. SETCR. Sets TYPSW for typewriter word processing, converts DTE character size to appropriate FR80 size, and DTE character deltas to FR80 units (CHDELX, CHDELT). Sets deltas based on rotation via ROTTST and SETPLS. Accesses starting line coordinates by call to GET, storing X in XHD and Y in YHD. Checks coordinates against those specified by index control record. If they match, control is transferred to STARTX. If not, subroutine exits via NOINDX. Calling sequence: JMP SETCR

JJ. SPACE3. Called during processing of 76 record EBCDIC identification; executes CRT IOT for three lines. Control is transferred to NEXTCH. Calling sequence: JMP SPACE3

KK. STARTX. Initializes STOCSW for access of index data, blank fills MTTARE buffer prior to transfer of index data, sets line position, and indexes field length. Returns control to calling routine. CHRCNT will be set to the number of index characters desired prior to the call. Calling sequence JMS STARTX

LL. STOCH. Entered with AC containing index character n. Stores character in MTTARE buffer and exits to calling routine, if index character count is less than zero. If index character count is exhausted, resets STOCSW for no index, processes index data by a call to INXDO, and returns to calling routine with character n in AC. Calling sequence: JMS STOCH

MM. TITREC. Moves title data into TITARE (or MTTARE for 16 mm) via MVCOM, calls FICTAP for title processing, resets CCNTRL for DTE data processing, outputs cutmark (16 mm only), and transfers control to IGNORE. Calling sequence: JMP TITREC

NN. TYPLP. Processes DTE special characters NULL, CR, and MR if neither, outputs as print character via CHROUT until CNTR (character counter equal -5 for 48 or -4 for 36) is exhausted. Entered either thru TYPSW or JMP TYPLP. Exits to GETCOM.

2.1.3.3 Constants and Variables

A. Internal

1. BITNSV. Temporary save location of number of bits requested by GET macro in SAVADD and RESTOR routines.

2. BITNUM. Contains number of bits requested by GET macro.

3. BITSVAD. Temporary save location of return address from GET call.

4. CHRCNT. Word containing the number of characters p~~ index entry as specified in F record.

5. CHTEM. Cell containing DTE character accessed from start print word.

6. CH11SW. Switch used for entry and exit into COM control processing. Set to JMS RESET after S COM record and NOP upon completion of second COM control record processing.

7. CNTR. Counter containing number of characters per DTE typewriter word.

8. DFRSZ. Constant containing frame size in FR80 units, either 13522 for 105 mm or 9600 for 16 mm.

9. DTESIZ. Temporary cell containing DTE character size (0-7) accessed from start print word.

.0. DTETAB. Table containing DTE character codes, two characters per word.

11. DTFORM. Switch used to control forms overlay processing: NOP forces output, SKP ignores.

12. DTXTAB. Table containing character spacing values in DTE units for eight-character sizes.

13. DTYTAB. Table containing line feed values in DTE units for eight-character sizes.

14. GETSGAD. Temporary save location of GETSEG routine return address.

15. INXSSW. Switch used to control index processing; SKP delineates indexing; NOP indicates no indexing.

16. MARKS. Counter which contains repeat count (-3) for output of four vector cutmarks.

17. MBITNM. Variable containing number of bits requested by GET macro in BITCNT routine.

18. MBITSV. Temporary save location of number of bits requested. Referenced in SAVADD and RESTOR.

19. MCHCNT. Variable containing number of characters per index entry as delineated in F control record.

20. MDELTA. Delineates delta X increment between four vector marks which constitute cutmark.

21. MRKBOT. Constant delineating end point (Y_2) of cutmark vectors.

22. MRKLFT. Starting X coordinate for cutmarks.

23. MRKTOP. Constant delineating start point (Y_1) of cutmark vectors.

24. NEWSGB. Variable containing n bits ($1 \leq n \leq 18$) of data from next record segment.

25. NEWSGC. Variable containing number of bits required from next record segment to satisfy GET macro.

26. OLDSGB. Variable containing n bits ($1 \leq n \leq 18$) of data remaining in current record segment.

27. OLDSGC. Variable containing number of bits remaining in current record segment.

28. RETADD. Cell containing BITCNT return address when processing COM control records.

29. SAVCHT. Temporary save location for non-COM control character in PROC76.

30. SDELTA. Delineates delta X increment between cutmark vectors.

31. SEGCNT. Counter containing number of bits in current record segment.

32. SEGSW. Switch used to reset BITCNT return address upon completion of COM control processing.

33. STOCSW. Switch used to control saving of index characters; NOP indicates no indexing; JMS STOCH indicates to save index character.

34. STRIPF. Switch used to determine output of cutmarks. NOP indicates output cutmarks; SKY in the strip chart mode indicates no cutmarks.

35. STROKS. Constant delineating number of vectors per mark for cutmarks.

36. SZTAB. Table containing character heights in DTE units for eight-character sizes.

37. TITINT. Constant delineating output light intensity for titling.

38. XHD. Contains starting X coordinate of DTE vector as accessed from DTE vector word.

39. XINDX. Contains X coordinate position of first DTE index character. Set by F COM control record.

40. XOFF. Starting X (or left-side margin) of DTE image in FR80 raster units.

41. XOFFOV. Starting X (or left margin) of EBCDIC identification frame in FR80 raster units.

42. XSIGN. Sign of X vector as defined by 36-bit DTE vector word.

43. XTL. Contains end X coordinate of DTE vector as accessed from DTE vector word.

44. YHD. Contains starting Y coordinate of DTE vector as accessed from DTE vector word.

45. YINDX. Contains Y coordinate position of first DTE index character. Set by F COM control record.

46. YOFF. Starting Y or top margin of DTE image in FR80 raster units.

47. YOFFOV. Starting Y or top margin of EBCDIC identification frame in FR80 raster units.

48. YSGN. Sign of Y vector as defined by 36-bit DTE vector word.

49. YTL. Contains end Y coordinate of DTE vector as accessed from DTE vector word.

B. External

1. CHDELX. Word location reserved for FR80 character delta X.

2. CHDELY. Word location reserved for FR80 character delta Y.

3. CHRSIZ. Word location reserved for FR80 character size.

4. CURBUF. Cell used for current magnetic tape buffer address (one of two magnetic tape buffers).

5. EXPND. Location used to define end of executable code.

6. FCSUB. One-word cell used either to decrease or increase margin between fiche.

7. FCTTSW. Switch used to control title extraction from tape or teletype.

8. FICTB. Address of fiche title table (i.e., titling buffer area).

9. FLSHND. Defines start of executable form flash code.

10. FRAMNM. One-word counter containing number of frames filmed.

11. IFLASW. Switch used to control output of index frame (SKP = output; NOP = no output).

12. IXXLEN. Variable delineating number of characters per index line.

13. MAXTRW. Constant used for multiple fiche title rows (always zero for DTE).

14. MTTARE. Contains teletype buffer address.

15. NEXBUF. Cell used for next magnetic tape buffer address (one of two magnetic tape buffers).

16. PBUFPT. Location used to define start of form flash communication area.

17. PICNUM. One-word counter containing number of images produced.

18. RECPIN. Word location reserved for FR80 light intensity value.

19. SCSIZE. Maximum available FR80 raster units (16384).

20. SVROT. One-word save location containing current rotation delineator.

21. TITARE. Address of fiche titling buffer.

22. TPOINT. Contains address of next available word in TITARE.

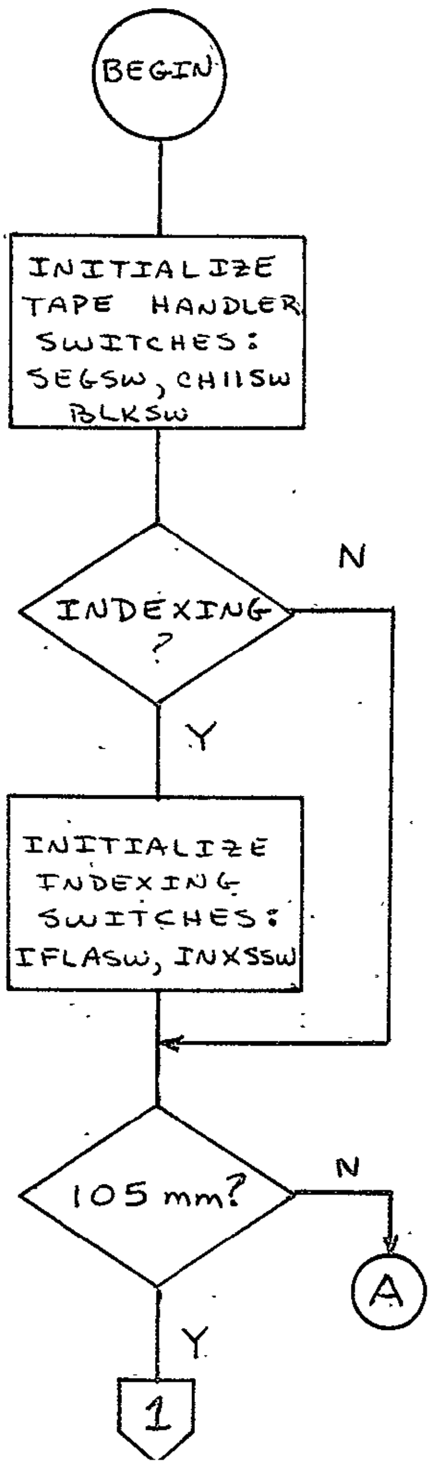
23. VHEADX. Word reserved for setting of starting X vector coordinate.

24. VHEADY. Word reserved for setting of starting Y vector coordinate.

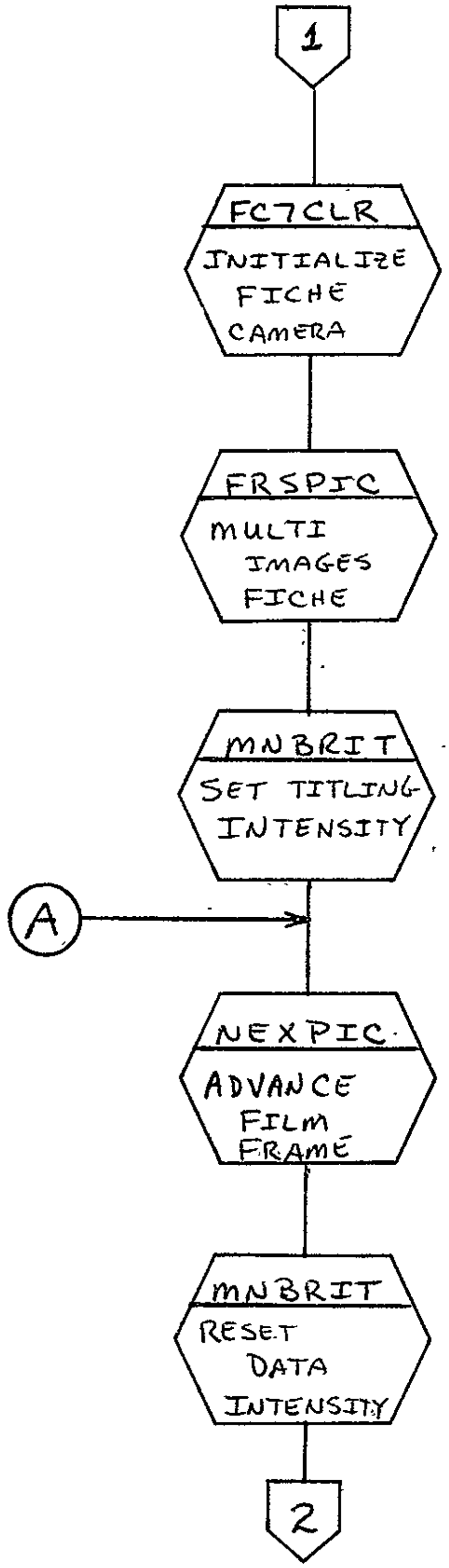
25. VTAILX. Word reserved for setting of ending X vector coordinate.

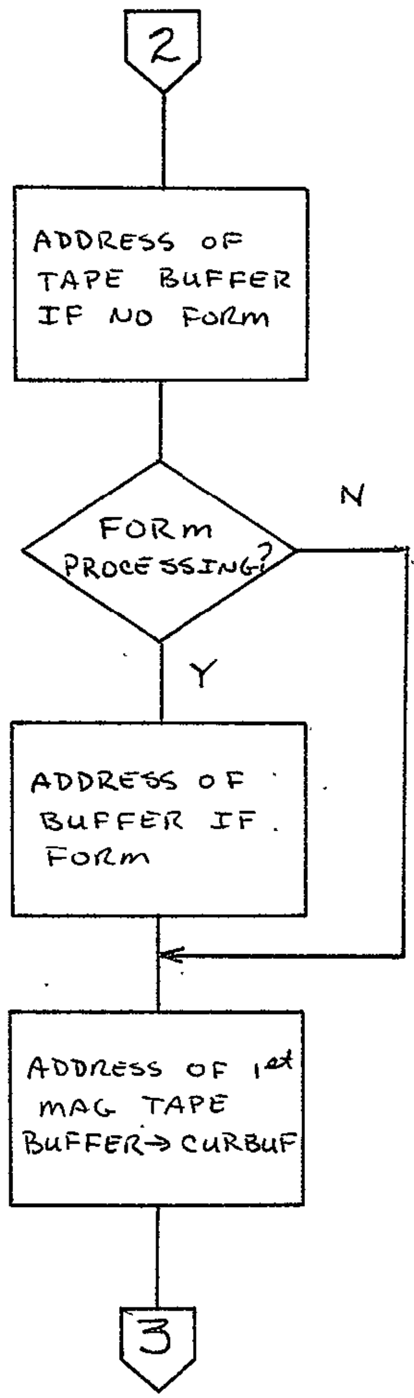
26. VTAILY. Word reserved for setting of ending Y vector coordinate.

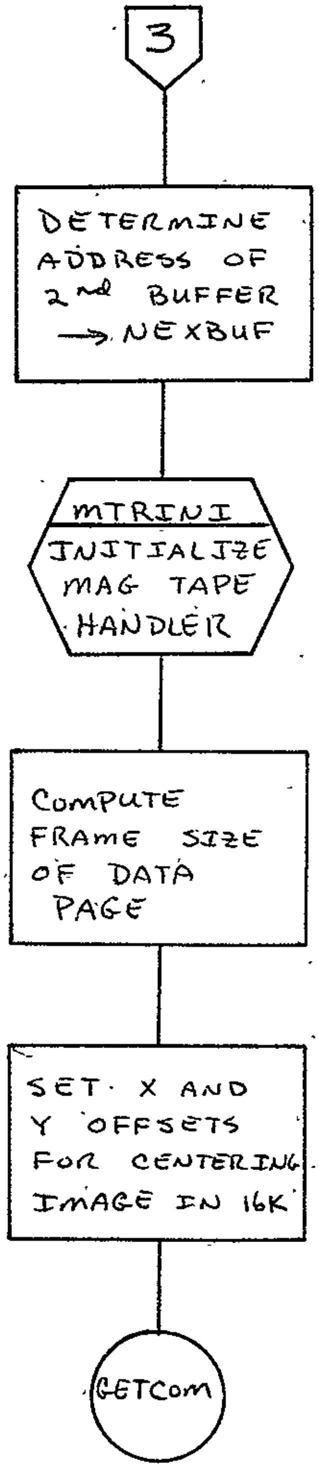
2.1.3.4 Flow Charts. See following pages.

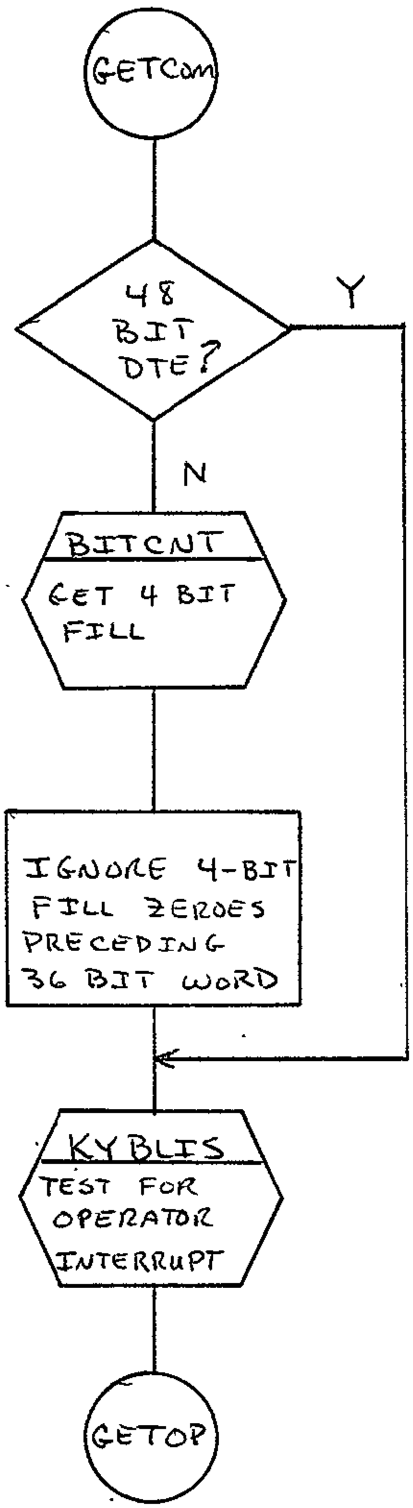


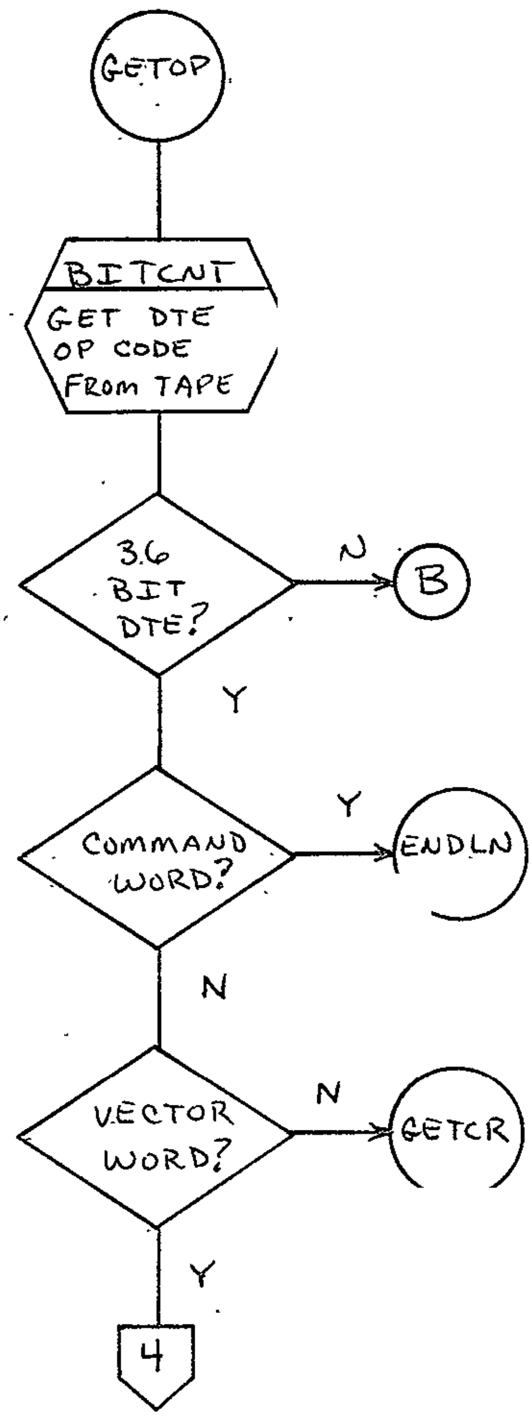
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

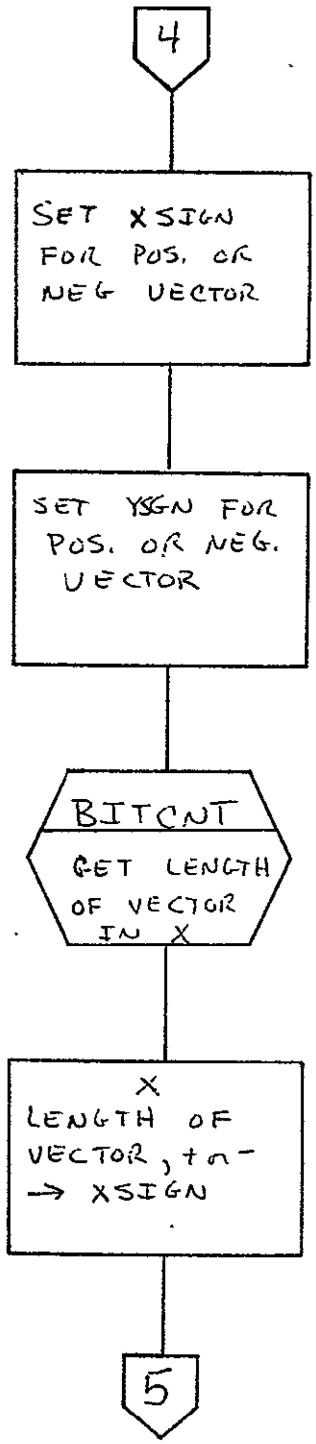

1
FC7CLR
INITIALIZE FICHE CAMERA
FRSPIC
MULTI IMAGES FICHE
MNBRIT
SET TITLING INTENSITY
A
NEXPIC
ADVANCE FILM FRAME
MNBRIT
RESET DATA INTENSITY
2


2
ADDRESS OF
TAPE BUFFER
IF NO FORM
FORM
PROCESSING?
N
Y
ADDRESS OF
BUFFER IF
FORM
ADDRESS OF 1st
MAG TAPE
BUFFER→CURBUF
3


3
DETERMINE ADDRESS OF 2nd BUFFER → NEXBUF
MTRINI
INITIALIZE MAG TAPE HANDLER
COMPUTE FRAME SIZE OF DATA PAGE
SET X AND Y OFFSETS FOR CENTERING IMAGE IN 16K
GETCOM


GETCom
48 BIT DTE?
Y
N
BITCNT
GET 4 BIT FILL
IGNORE 4-BIT FILL ZEROES PRECEDING 36 BIT WORD
KYBLIS
TEST FOR OPERATOR INTERRUPT
GETOP


GETOP
BITCNT
GET DTE
OP CODE
FROM TAPE
36
BIT
DTE?
N
B
Y
COMMAND
WORD?
Y
ENDLN
N
VECTOR
WORD?
N
GETCR
Y
4



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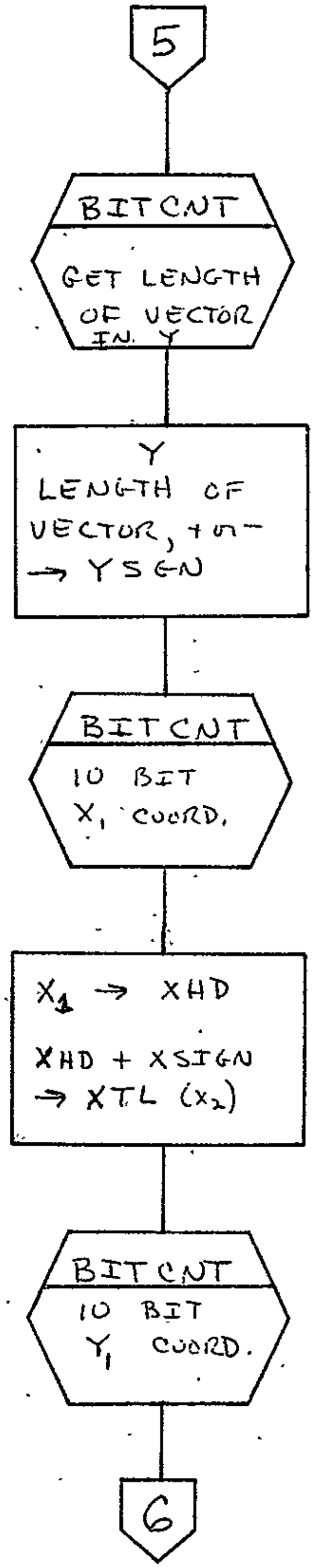
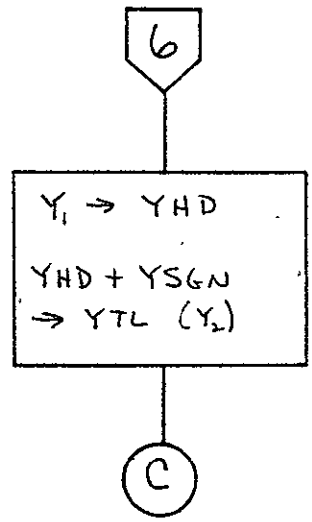
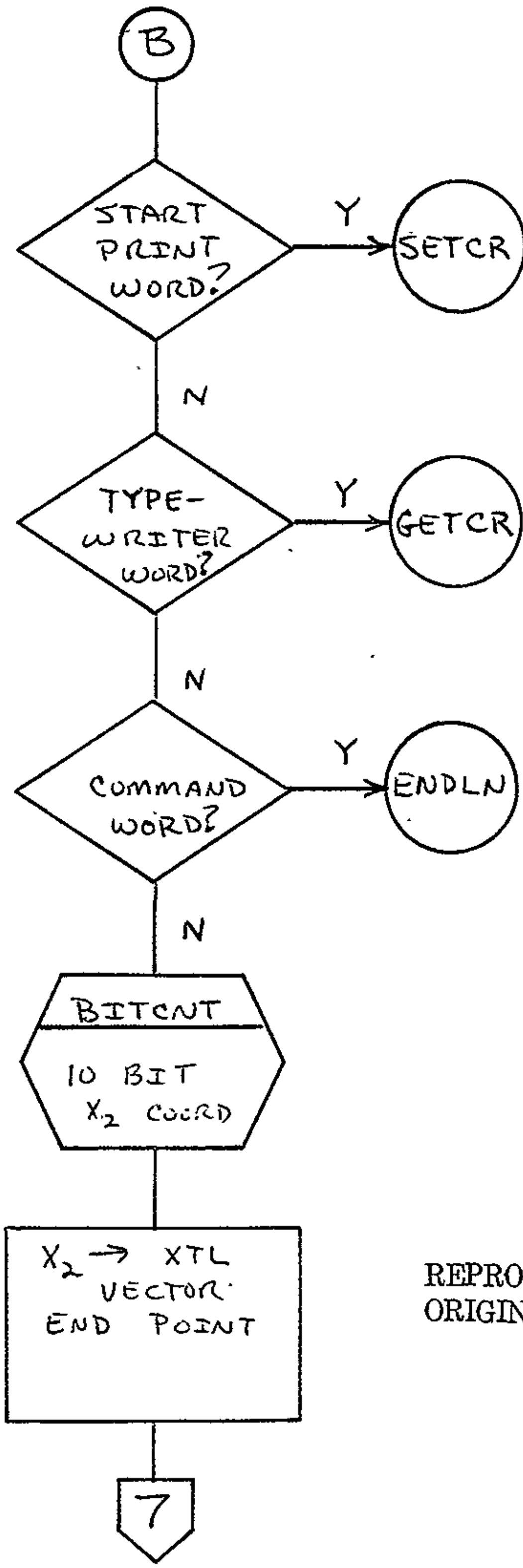
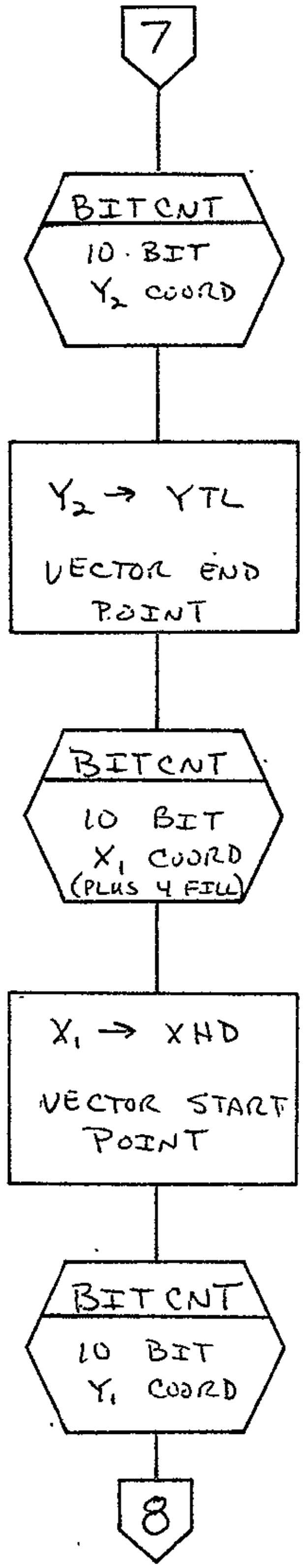
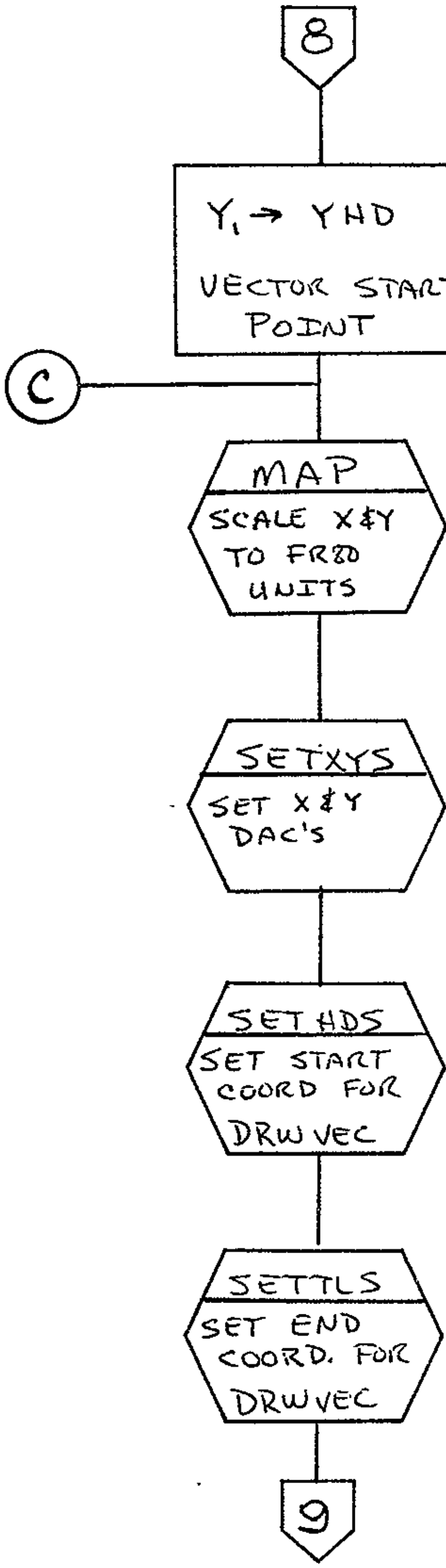

5
BITCNT
GET LENGTH OF VECTOR IN Y
Y LENGTH OF VECTOR, + or - → YSGN
BITCNT
10 BIT X1 COORD.
X1 → XHD
XHD + XSIGN → XTL (X2)
BITCNT
10 BIT Y1 COORD.
6

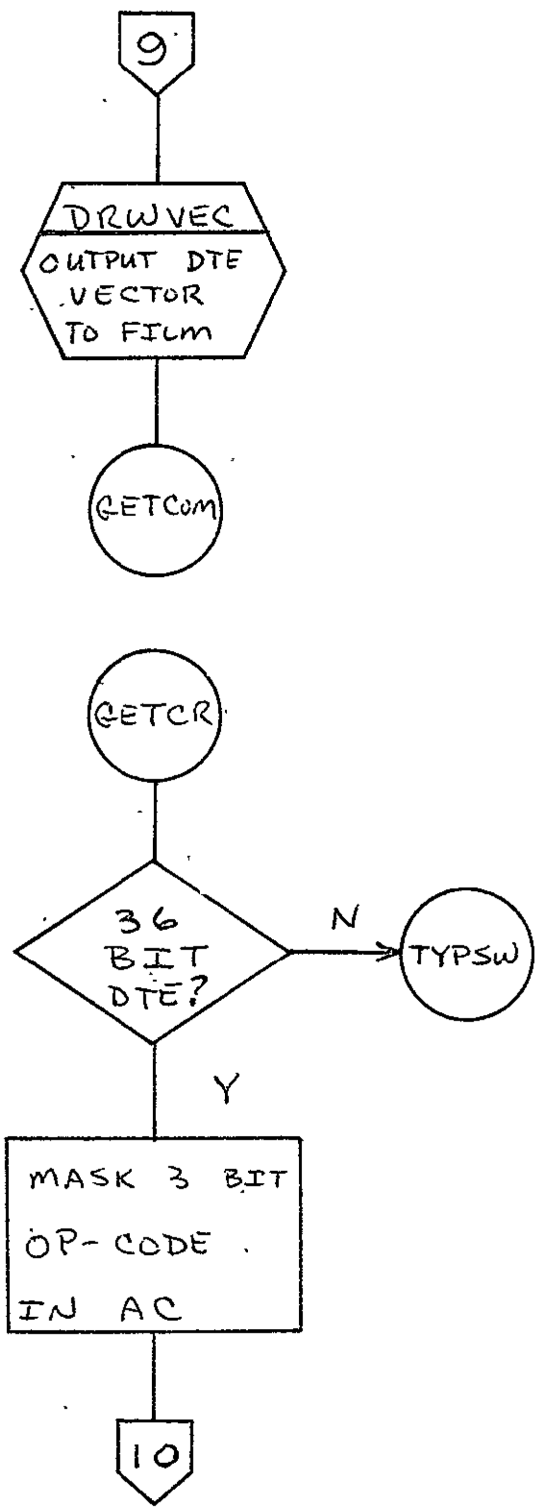

6
Y_1 → YHD
YHD + YSGN
→ YTL (Y_2)
C

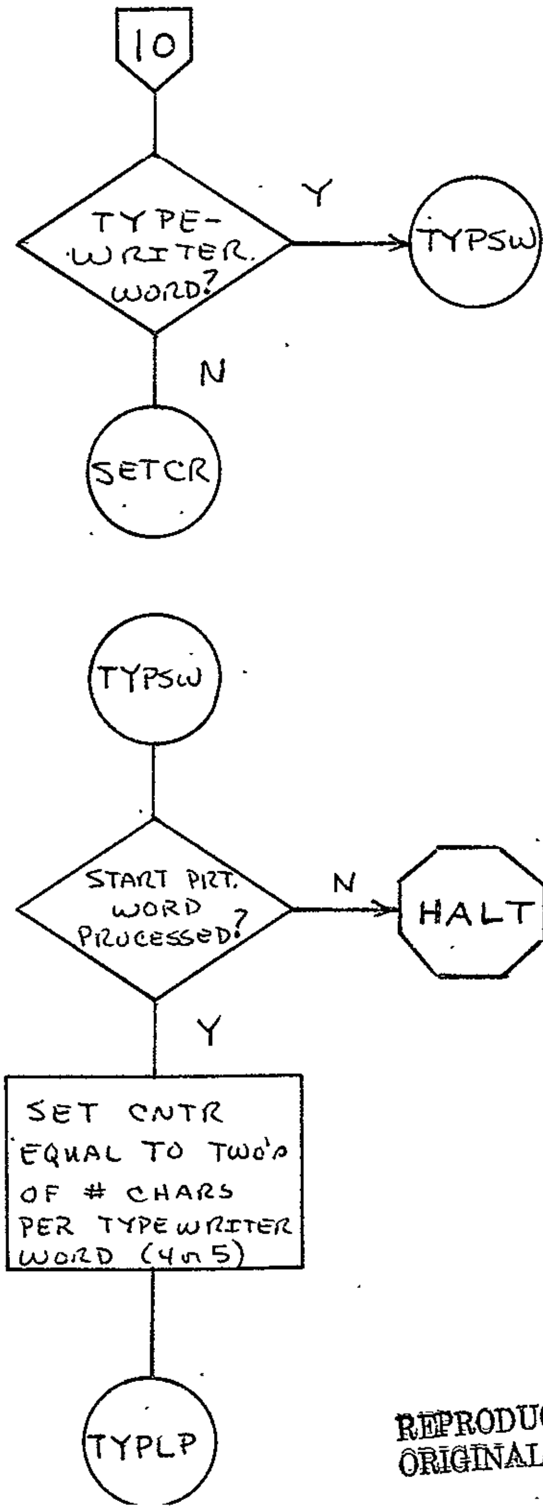


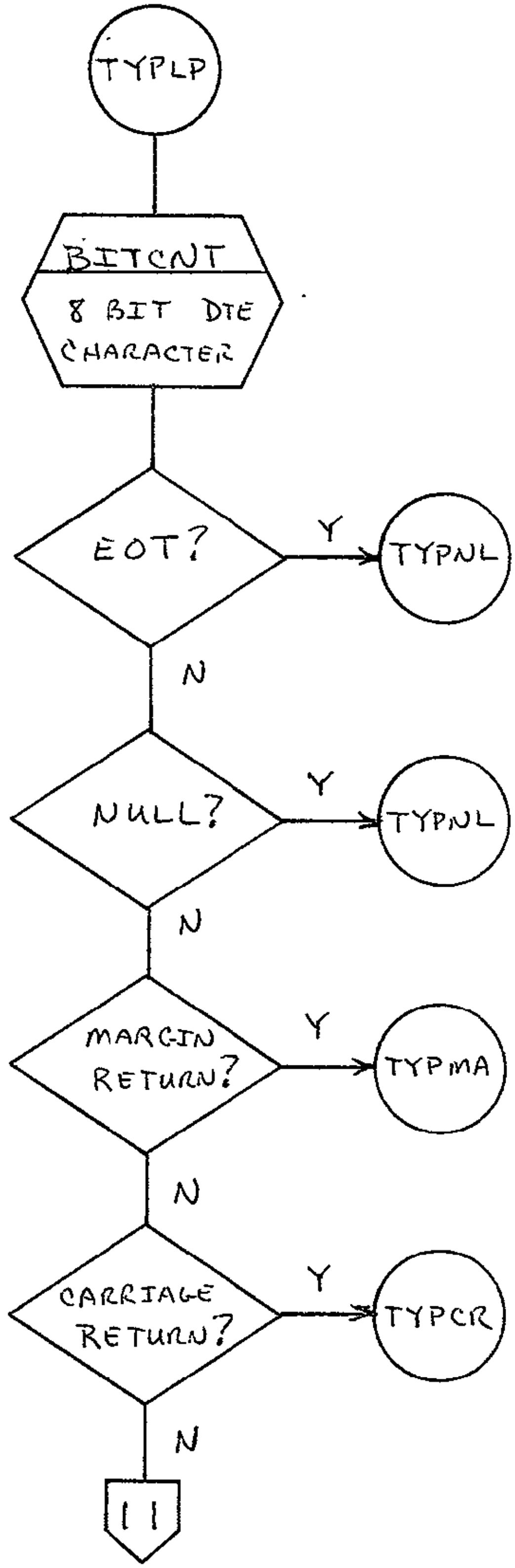
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

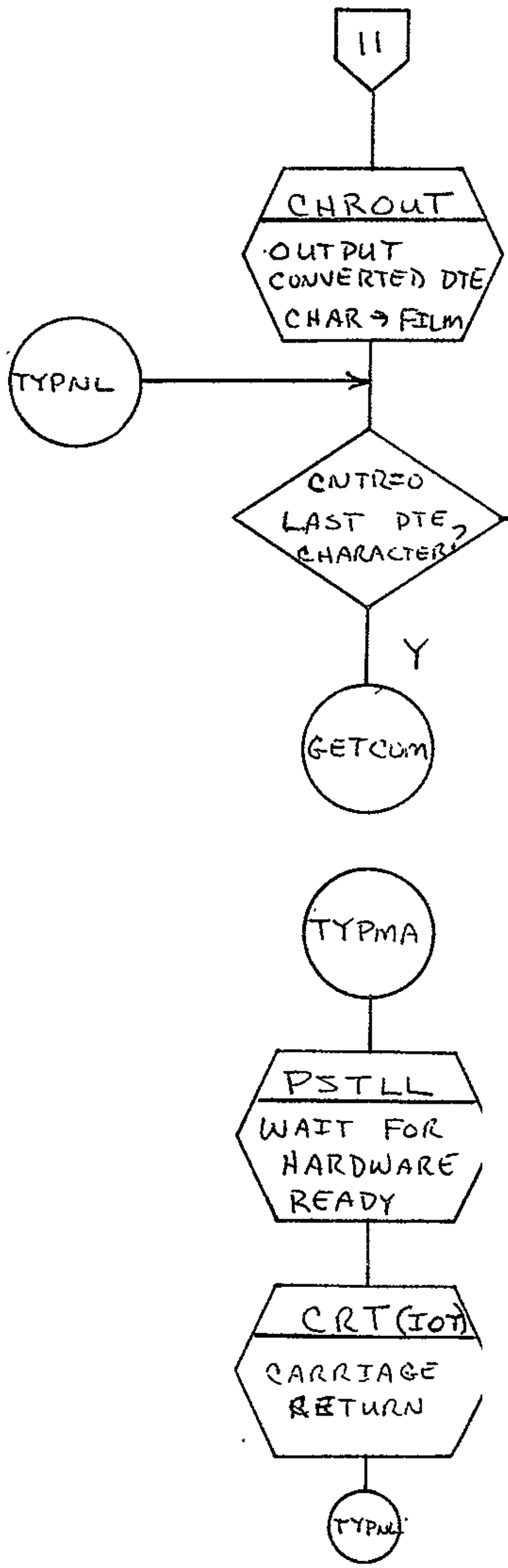

7
BITCNT
10 BIT
Y2 COORD
Y2 → YTL
VECTOR END
POINT
BITCNT
10 BIT
X1 COORD
(PLUS 4 FILL)
X1 → XHD
VECTOR START
POINT
BITCNT
10 BIT
Y1 COORD
8

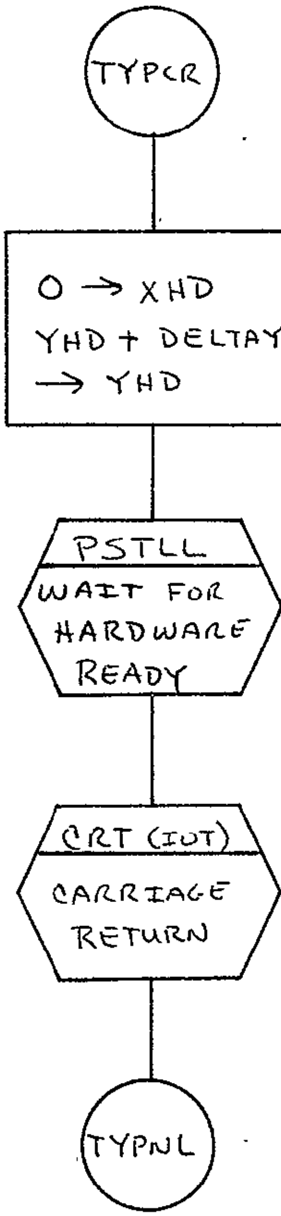

8
$Y_1 \rightarrow$ YHD
VECTOR START POINT
C
MAP
SCALE X&Y TO FR80 UNITS
SETXYS
SET X&Y DAC'S
SETHDS
SET START COORD FOR DRWVEC
SETTLS
SET END COORD. FOR DRWVEC
9

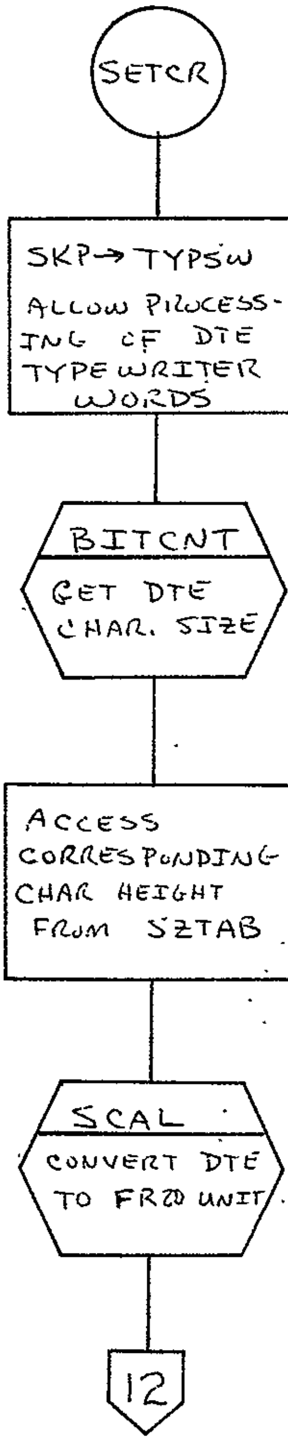

9
DRWVEC
OUTPUT DTE VECTOR TO FILM
GETCOM
GETCR
36 BIT DTE?
N
TYPSW
Y
MASK 3 BIT OP-CODE IN AC
10


10
TYPE-WRITER WORD?
Y
TYPSW
N
SETCR
TYPSW
START PRT. WORD PROCESSED?
N
HALT
Y
SET CNTR EQUAL TO TWO's OF # CHARS PER TYPEWRITER WORD (4 or 5)
TYPLP


TYPLP
BITCNT
8 BIT DTE CHARACTER
EOT?
Y
TYPNL
N
NULL?
Y
TYPNL
N
MARGIN RETURN?
Y
TYPMA
N
CARRIAGE RETURN?
Y
TYPCR
N
11


11
CHROUT
OUTPUT CONVERTED DTE CHAR → FILM
TYPNL
CNTR=0 LAST DTE CHARACTER?
N
TYPLP
Y
GETCOM
TYPMA
PSTLL
WAIT FOR HARDWARE READY
CRT(IOT)
CARRIAGE RETURN
TYPNL


TYPCR
0 → XHD
YHD + DELTAY
→ YHD
PSTLL
WAIT FOR
HARDWARE
READY
CRT (IOT)
CARRIAGE
RETURN
TYPNL



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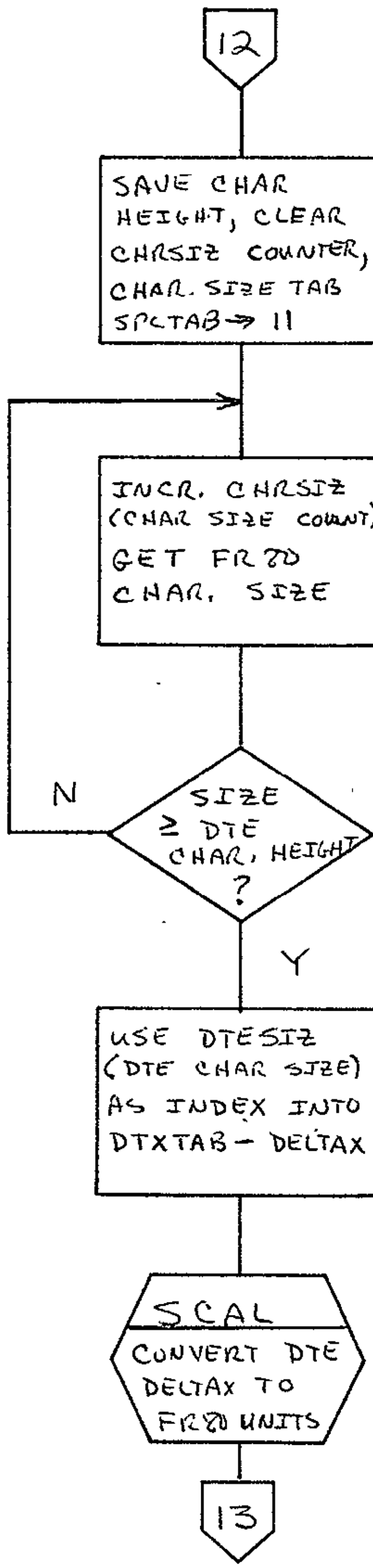
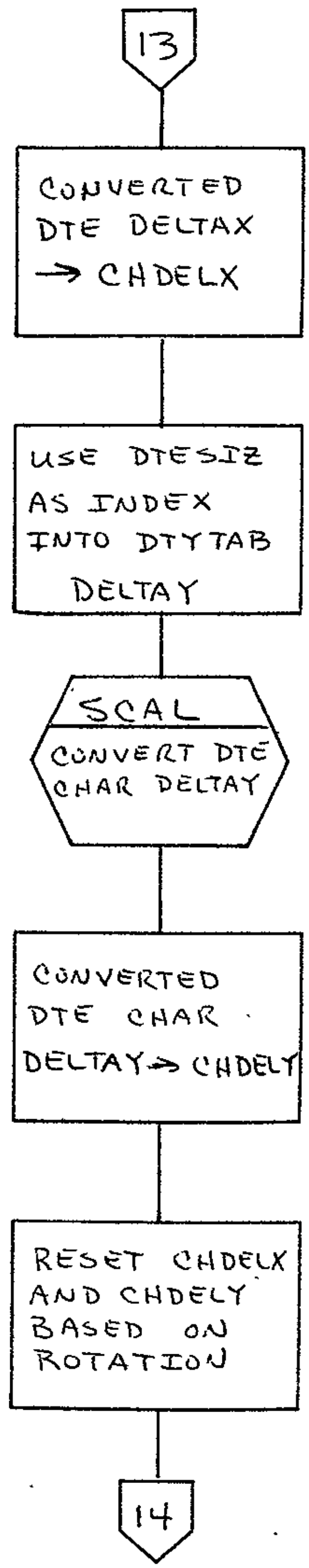
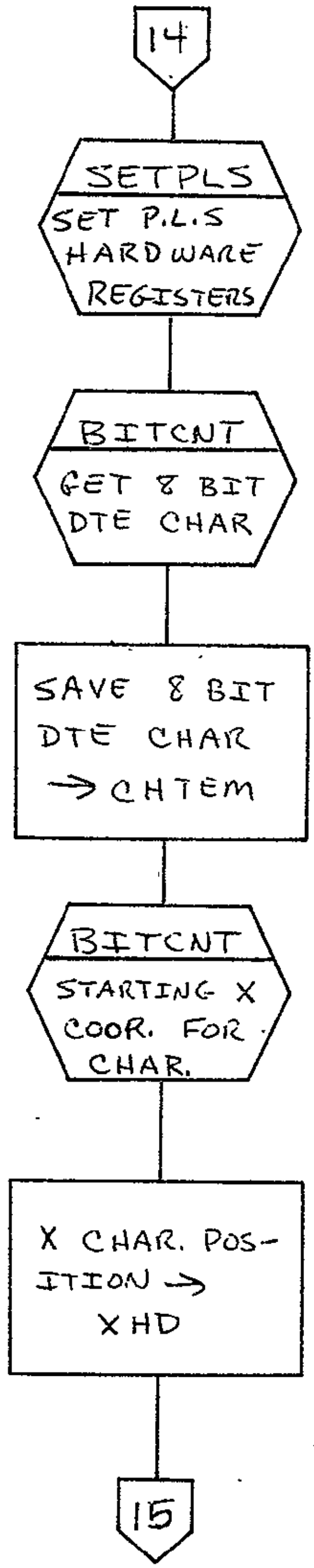
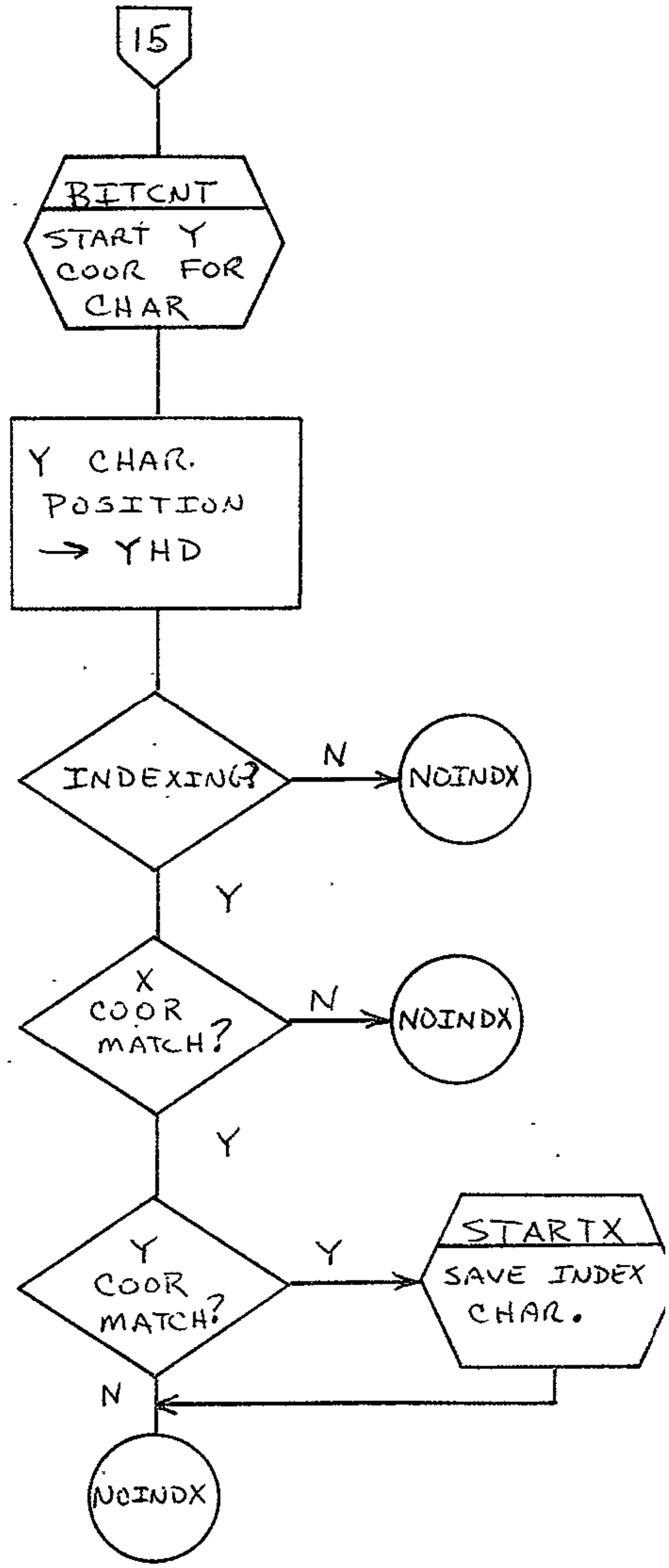
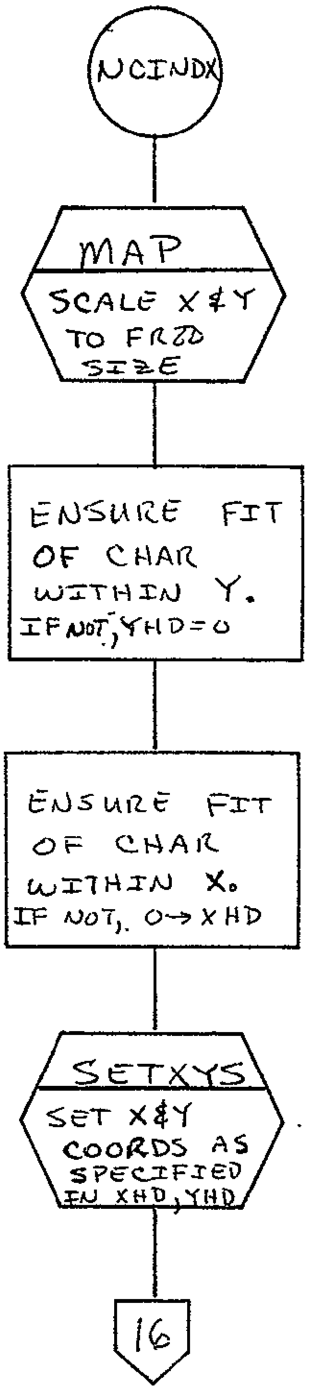
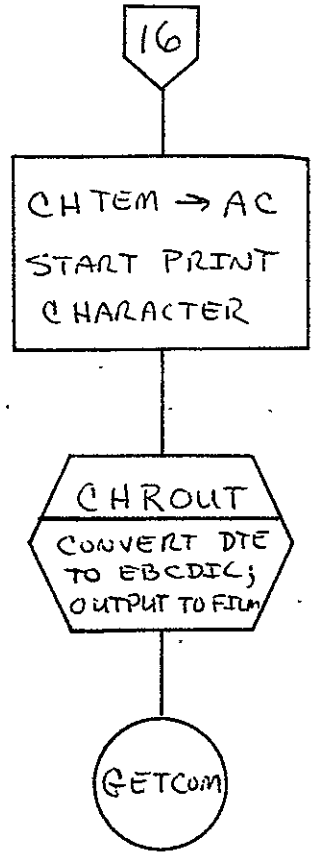

12
SAVE CHAR HEIGHT, CLEAR CHRSIZ COUNTER, CHAR. SIZE TAB SPCTAB → 11
INCR. CHRSIZ (CHAR SIZE COUNT) GET FR80 CHAR. SIZE
SIZE ≥ DTE CHAR. HEIGHT ?
N
Y
USE DTESIZ (DTE CHAR SIZE) AS INDEX INTO DTXTAB → DELTAX
SCAL
CONVERT DTE DELTAX TO FR80 UNITS
13

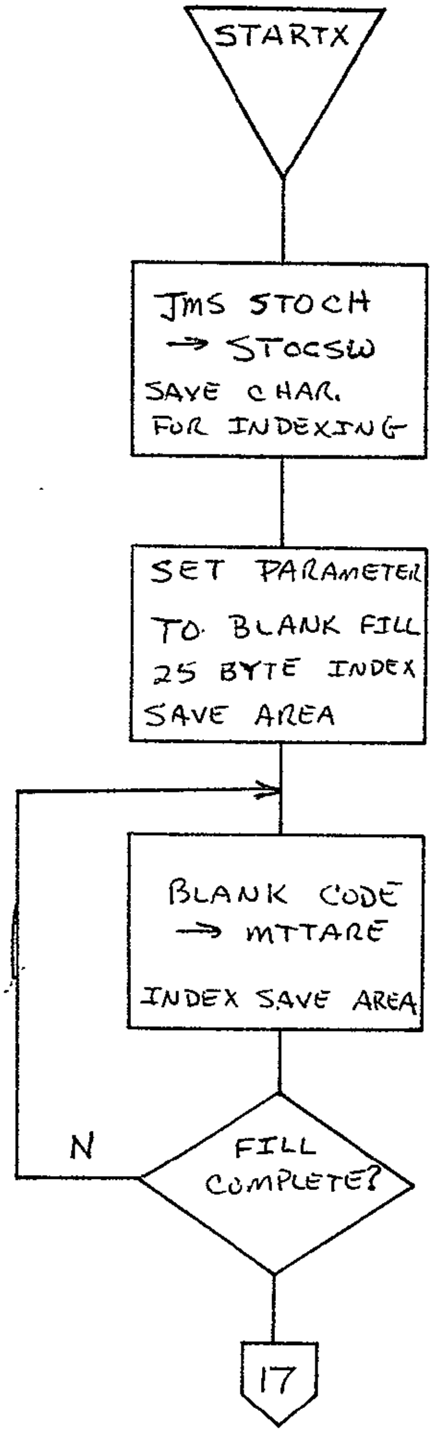

13
CONVERTED
DTE DELTAX
→ CHDELX
USE DTESIZ
AS INDEX
INTO DTYTAB
DELTAY
SCAL
CONVERT DTE
CHAR DELTAY
CONVERTED
DTE CHAR
DELTAY→ CHDELY
RESET CHDELX
AND CHDELY
BASED ON
ROTATION
14

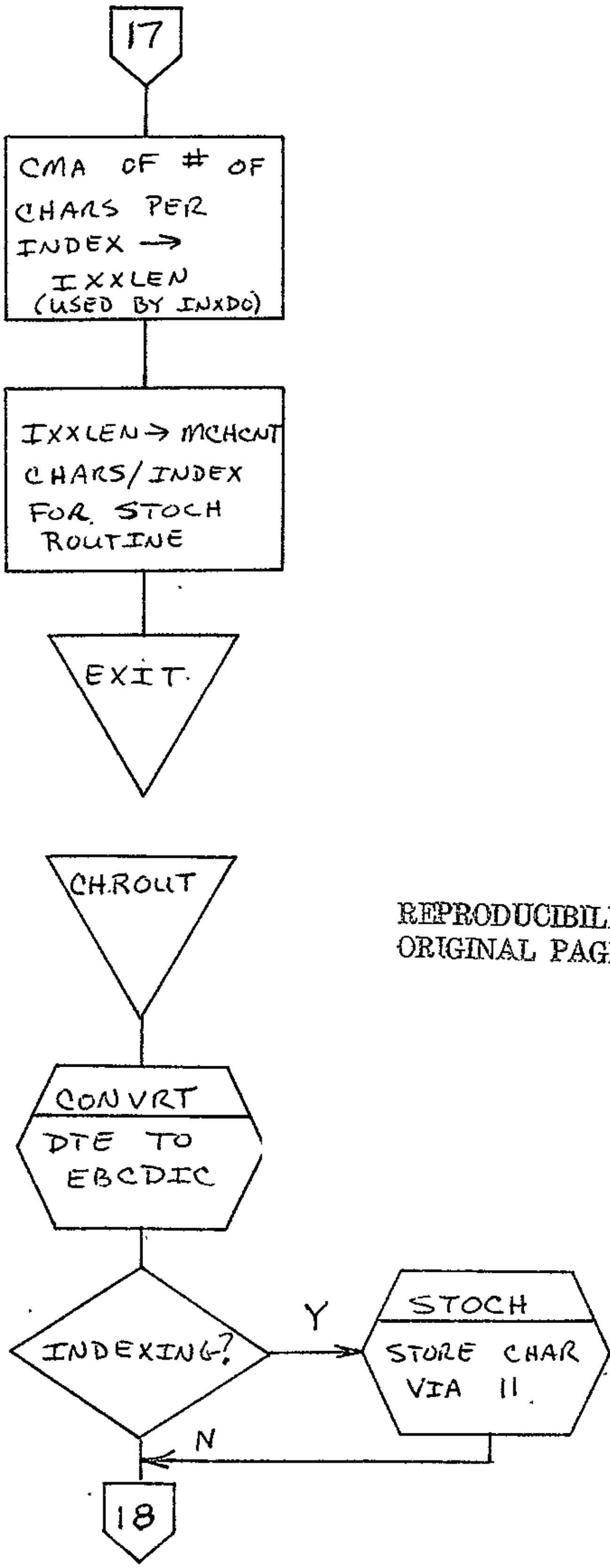

14
SETPLS
SET P.L.S HARDWARE REGISTERS
BITCNT
GET 8 BIT DTE CHAR
SAVE 8 BIT DTE CHAR → CHTEM
BITCNT
STARTING X COOR. FOR CHAR.
X CHAR. POS-ITION → XHD
15

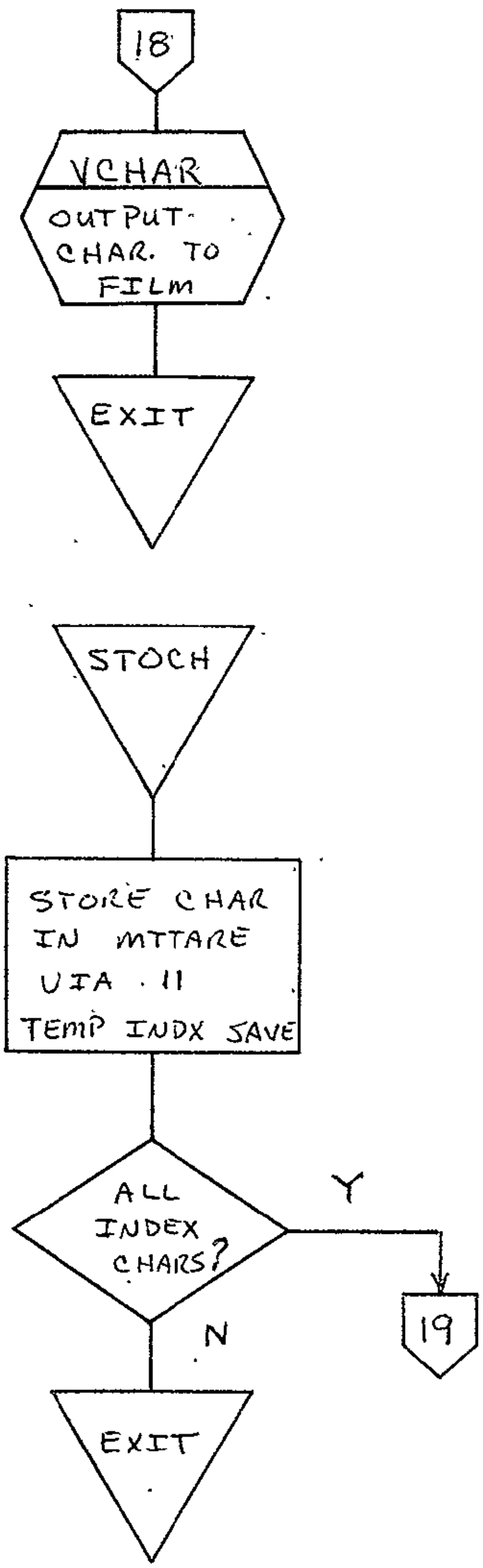

15
BITCNT
START Y COOR FOR CHAR
Y CHAR. POSITION → YHD
INDEXING?
N
NOINDX
Y
X COOR MATCH?
N
NOINDX
Y
Y COOR MATCH?
Y
STARTX
SAVE INDEX CHAR.
N
NOINDX

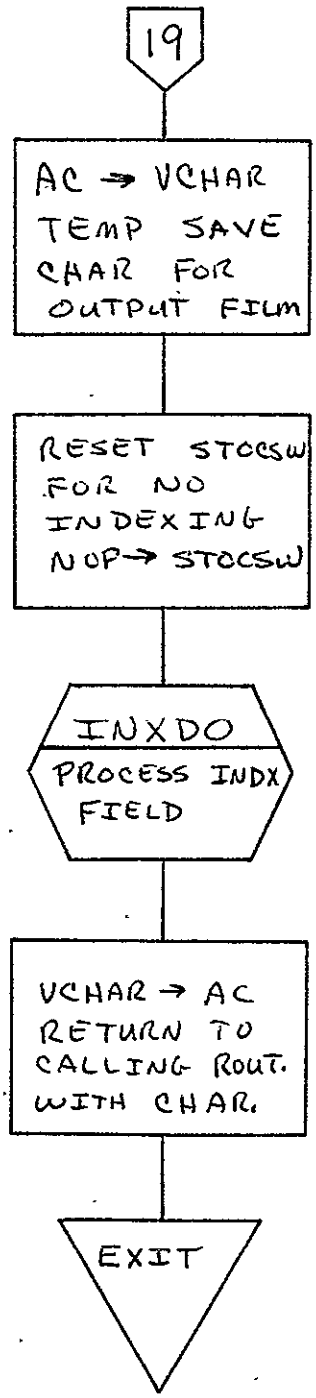

NCINDX
MAP
SCALE X&Y TO FRZD SIZE
ENSURE FIT OF CHAR WITHIN Y. IF NOT, YHD=0
ENSURE FIT OF CHAR WITHIN X. IF NOT, 0→XHD
SETXYS
SET X&Y COORDS AS SPECIFIED IN XHD, YHD
16

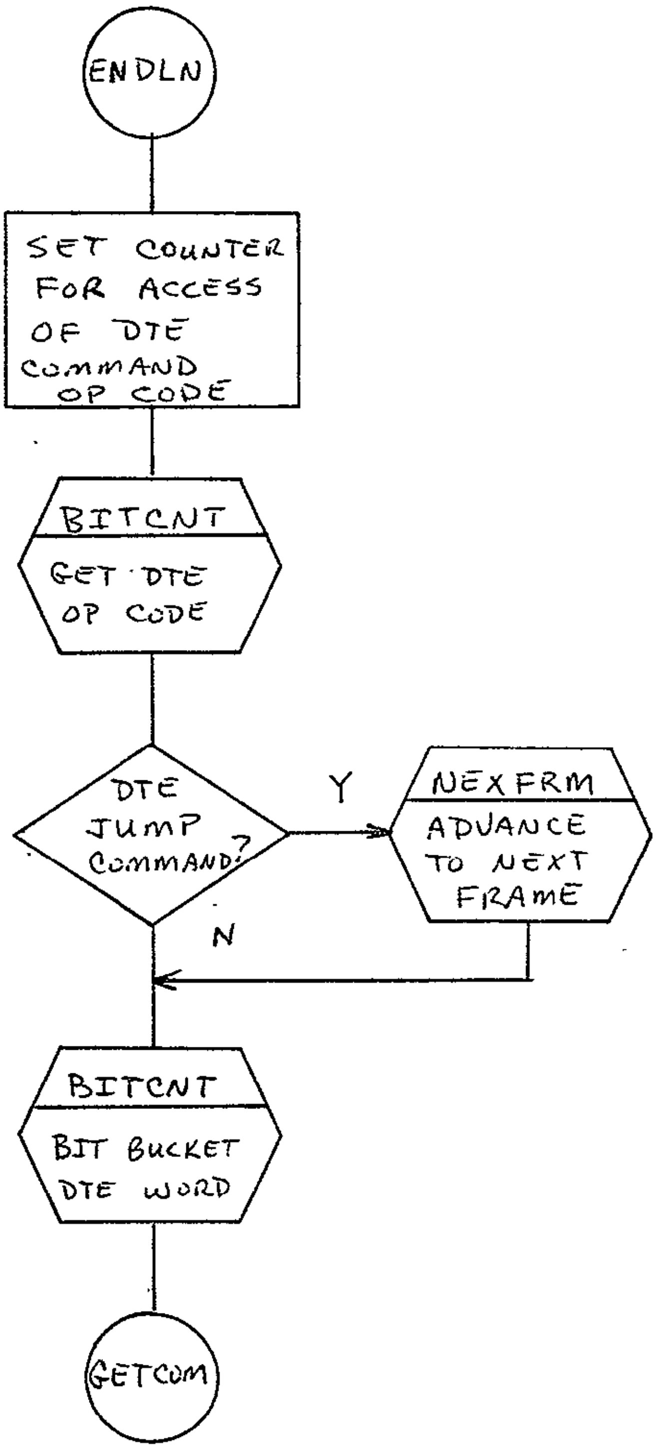

16
CHTEM → AC
START PRINT
CHARACTER
CHROUT
CONVERT DTE
TO EBCDIC;
OUTPUT TO FILM
GETCOM

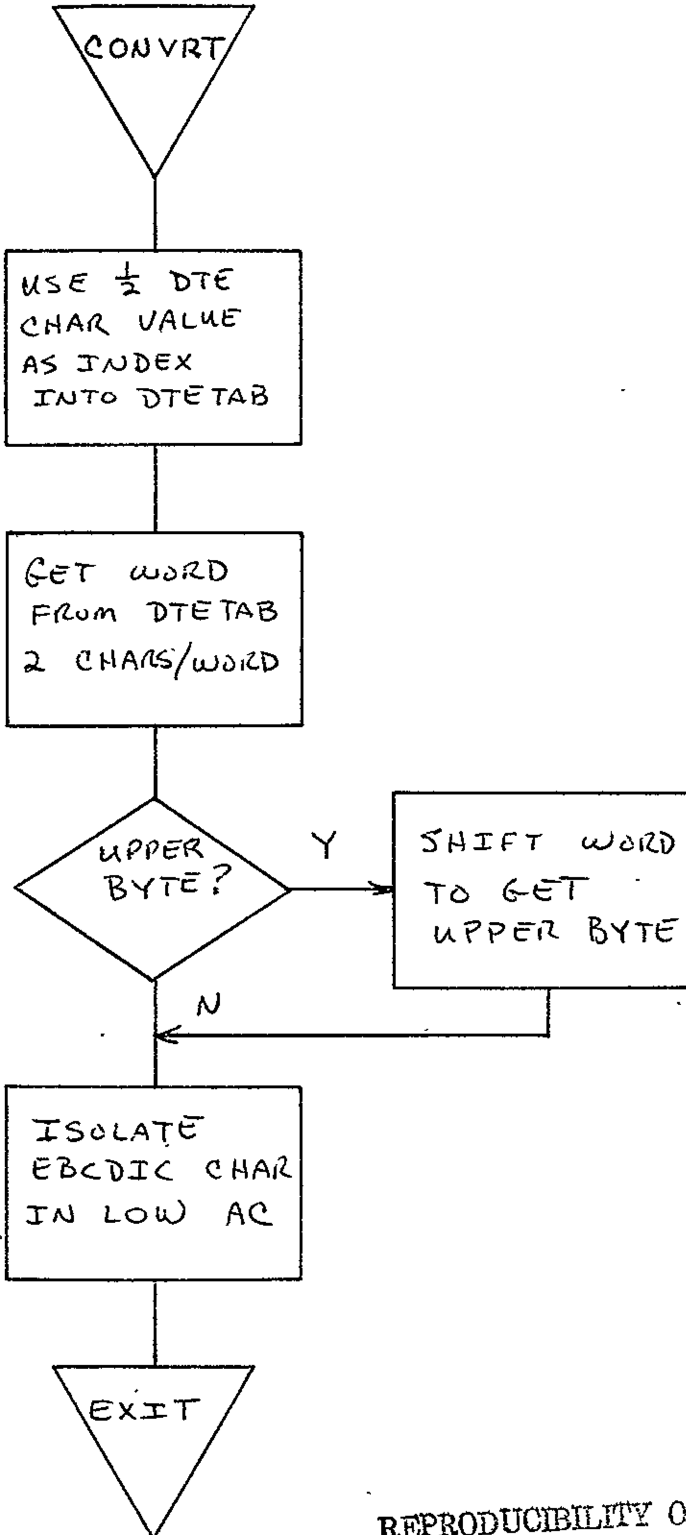

STARTX
JMS STOCH
→ STOCSW
SAVE CHAR.
FOR INDEXING
SET PARAMETER
TO BLANK FILL
25 BYTE INDEX
SAVE AREA
BLANK CODE
→ MTTARE
INDEX SAVE AREA
N
FILL
COMPLETE?
17

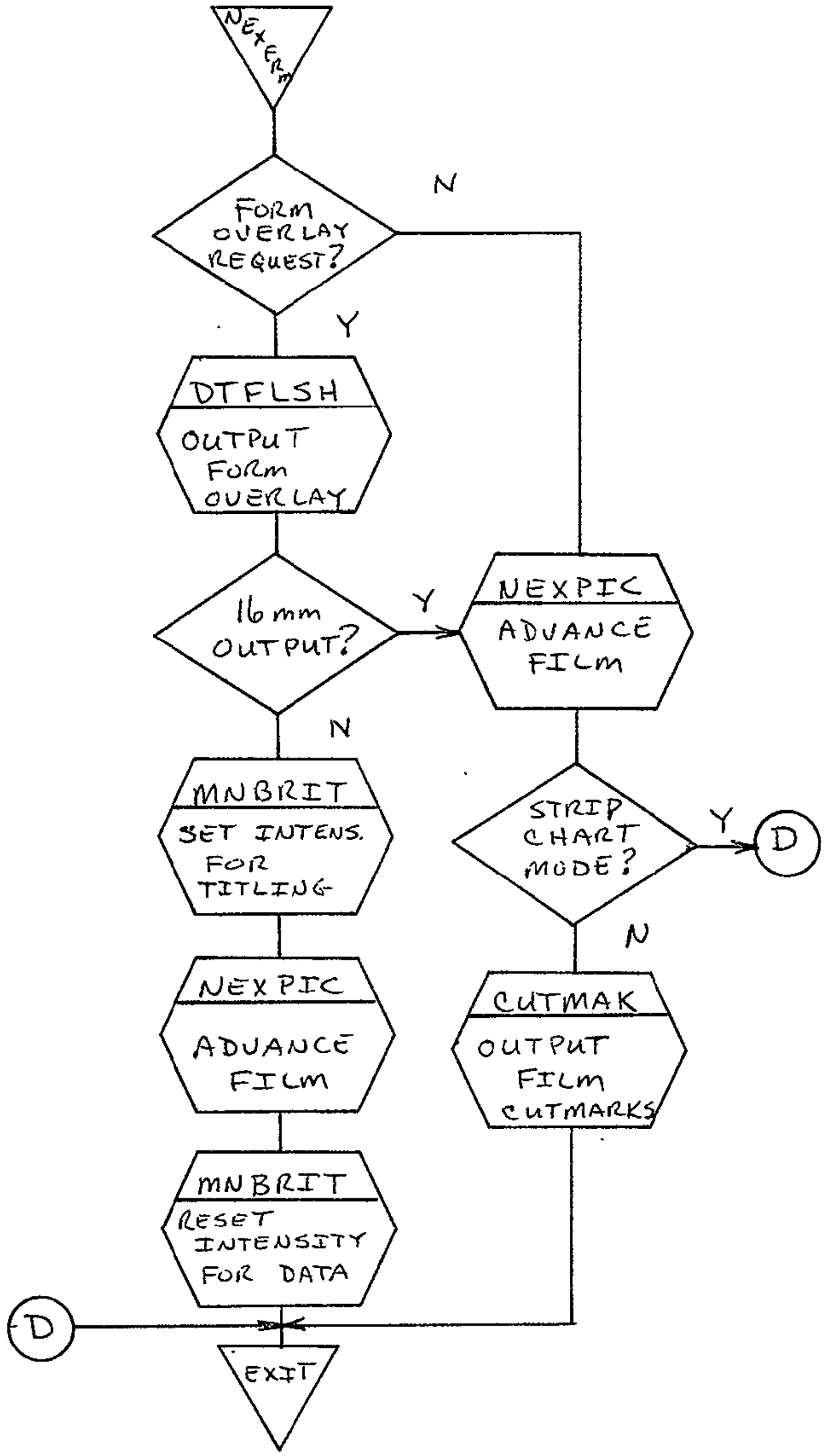

17
CMA OF # OF CHARS PER INDEX → IXXLEN (USED BY INXDO)
IXXLEN → MCHCNT CHARS/INDEX FOR STOCH ROUTINE
EXIT
CHROUT
CONVRT
DTE TO EBCDIC
INDEXING?
Y
STOCH
STORE CHAR VIA 11
N
18

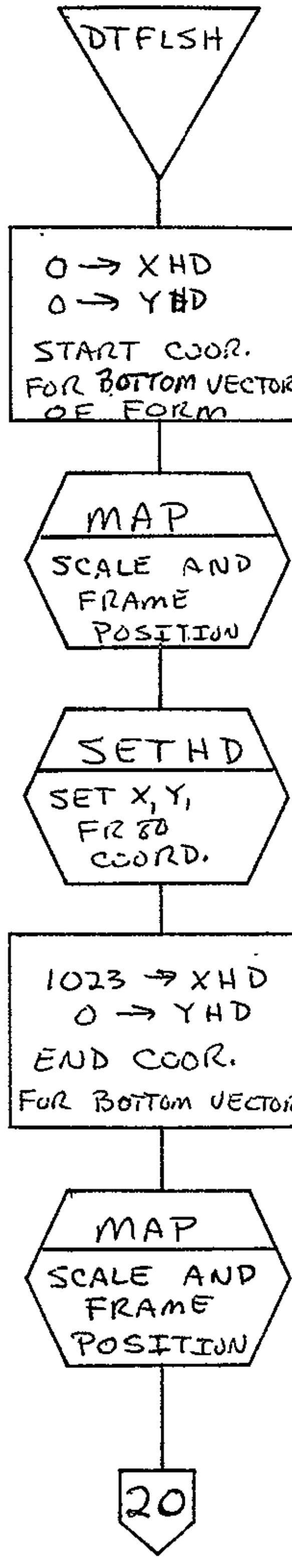

18
VCHAR
OUTPUT CHAR. TO FILM
EXIT
STOCH
STORE CHAR IN MTTARE VIA .11 TEMP INDX SAVE
ALL INDEX CHARS?
Y
19
N
EXIT

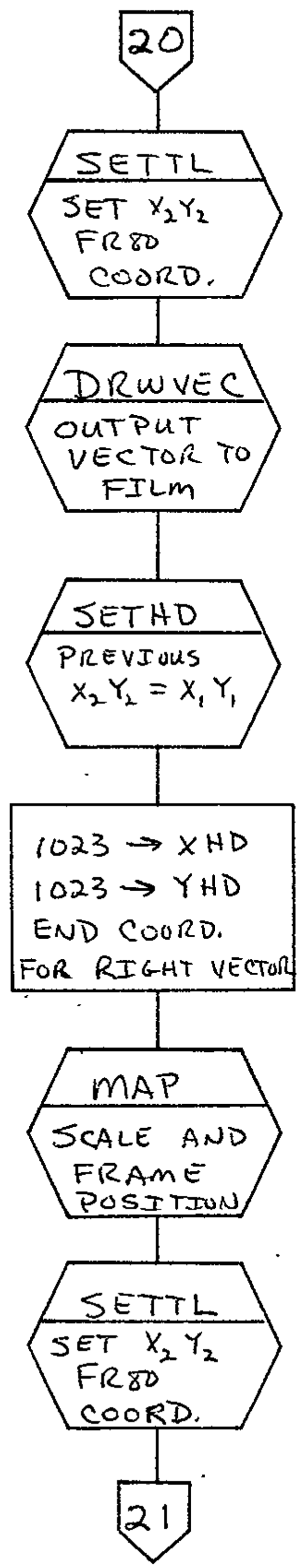

19
AC → VCHAR
TEMP SAVE
CHAR FOR
OUTPUT FILM
RESET STOCSW
FOR NO
INDEXING
NOP → STOCSW
INXDO
PROCESS INDX
FIELD
VCHAR → AC
RETURN TO
CALLING ROUT.
WITH CHAR.
EXIT

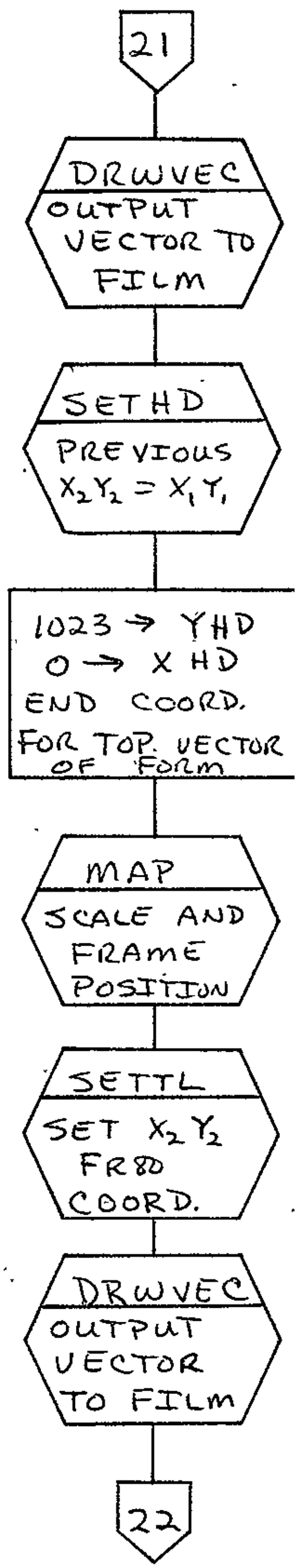

ENDLN
SET COUNTER FOR ACCESS OF DTE COMMAND OP CODE
BITCNT
GET DTE OP CODE
DTE JUMP COMMAND?
Y
NEXFRM
ADVANCE TO NEXT FRAME
N
BITCNT
BIT BUCKET DTE WORD
GETCOM

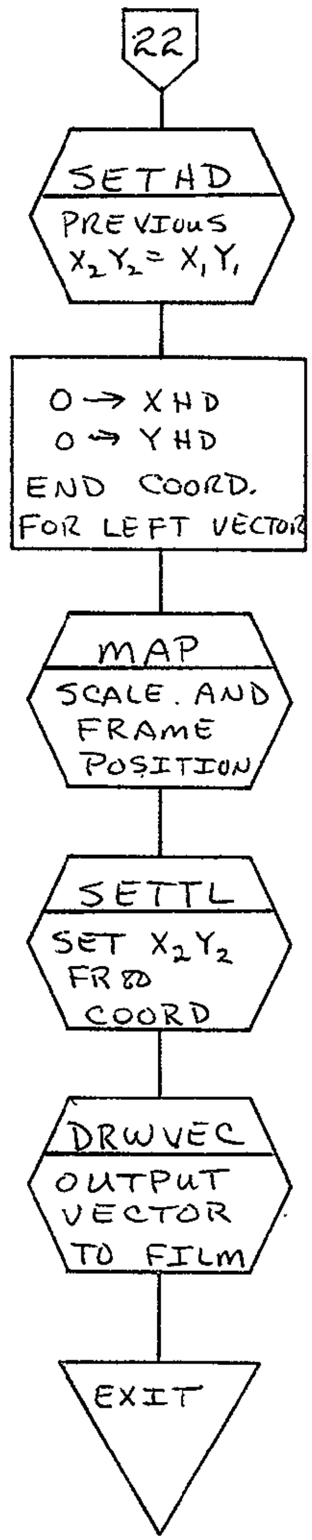

CONVRT
USE ½ DTE CHAR VALUE AS INDEX INTO DTETAB
GET WORD FROM DTETAB 2 CHARS/WORD
UPPER BYTE?
Y
SHIFT WORD TO GET UPPER BYTE
N
ISOLATE EBCDIC CHAR IN LOW AC
EXIT

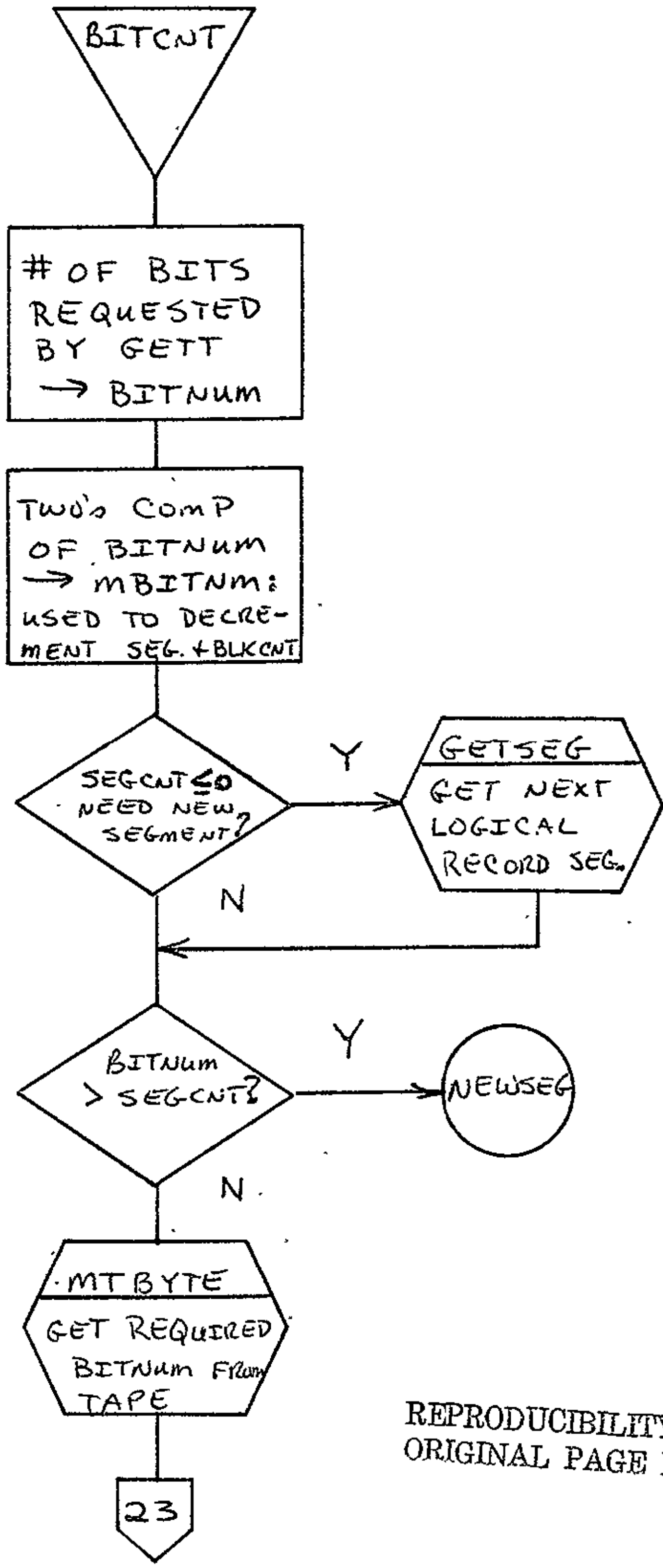

NEXFRM
FORM OVERLAY REQUEST?
N
Y
DTFLSH
OUTPUT FORM OVERLAY
16 mm OUTPUT?
Y
N
NEXPIC
ADVANCE FILM
MNBRIT
SET INTENS. FOR TITLING
STRIP CHART MODE?
Y
D
N
NEXPIC
ADVANCE FILM
CUTMAK
OUTPUT FILM CUTMARKS
MNBRIT
RESET INTENSITY FOR DATA
D
EXIT

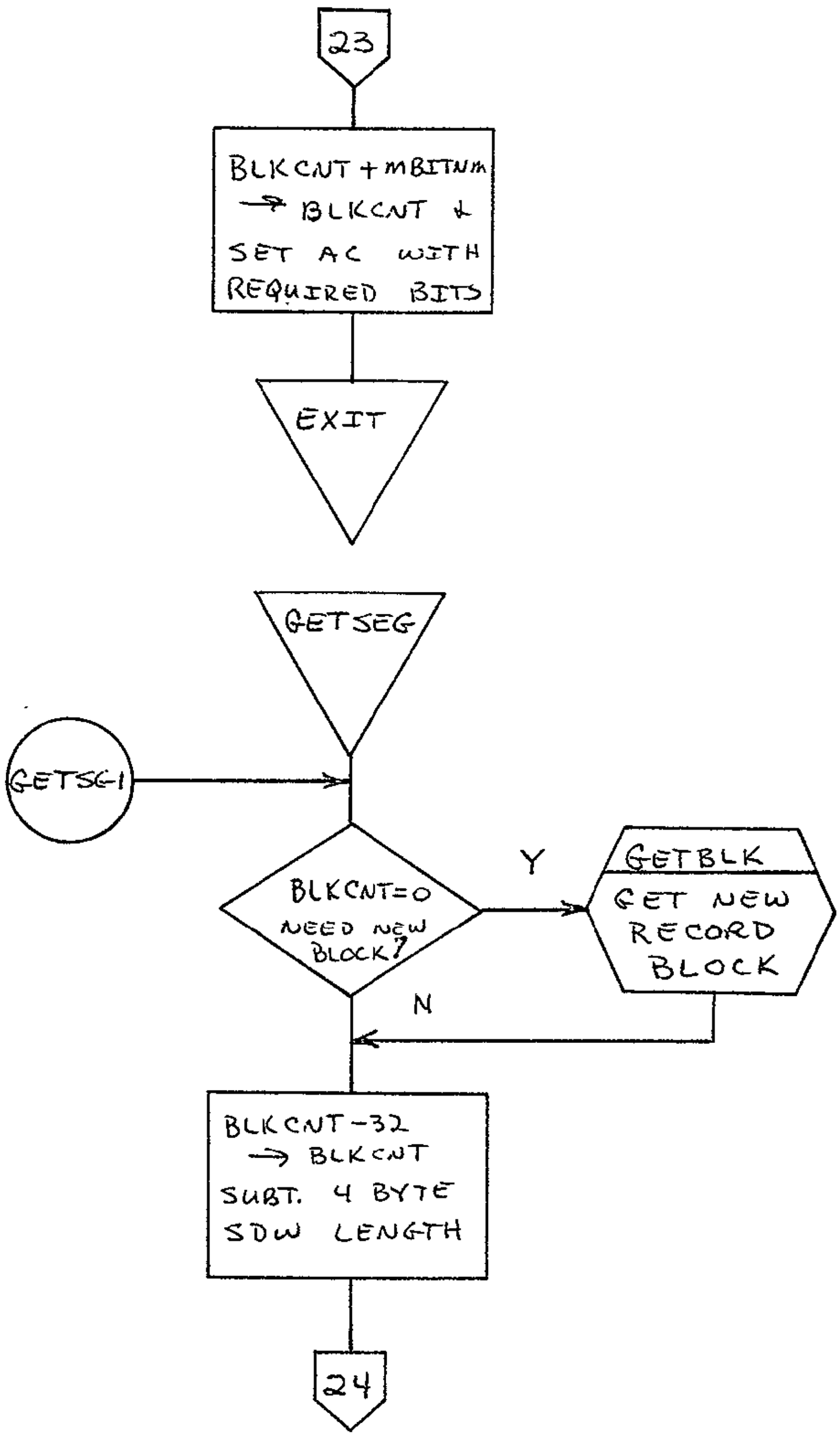

DTFLSH
0 → XHD
0 → YHD
START COOR.
FOR BOTTOM VECTOR
OF FORM
MAP
SCALE AND
FRAME
POSITION
SETHD
SET X, Y,
FR 80
COORD.
1023 → XHD
0 → YHD
END COOR.
FOR BOTTOM VECTOR
MAP
SCALE AND
FRAME
POSITION
20

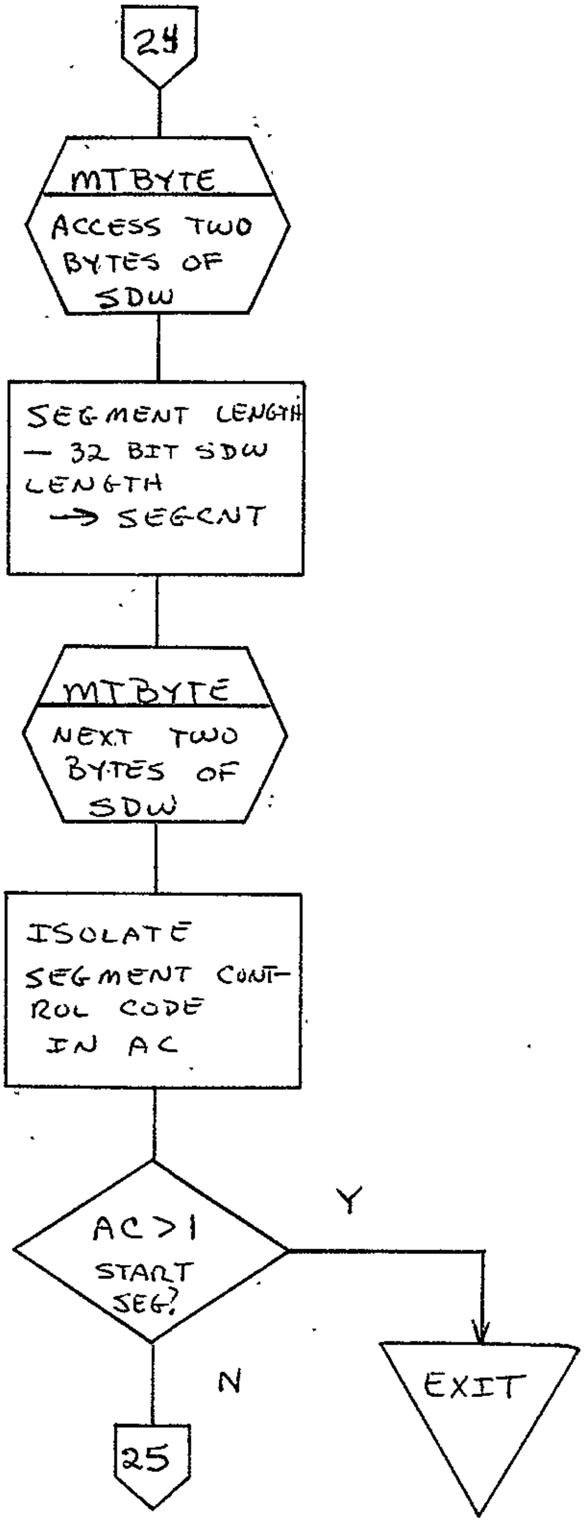

20
SETTL
SET X_2Y_2
FR80
COORD.
DRWVEC
OUTPUT
VECTOR TO
FILM
SETHD
PREVIOUS
$X_2Y_2 = X_1Y_1$
1023 → XHD
1023 → YHD
END COORD.
FOR RIGHT VECTOR
MAP
SCALE AND
FRAME
POSITION
SETTL
SET X_2Y_2
FR80
COORD.
21

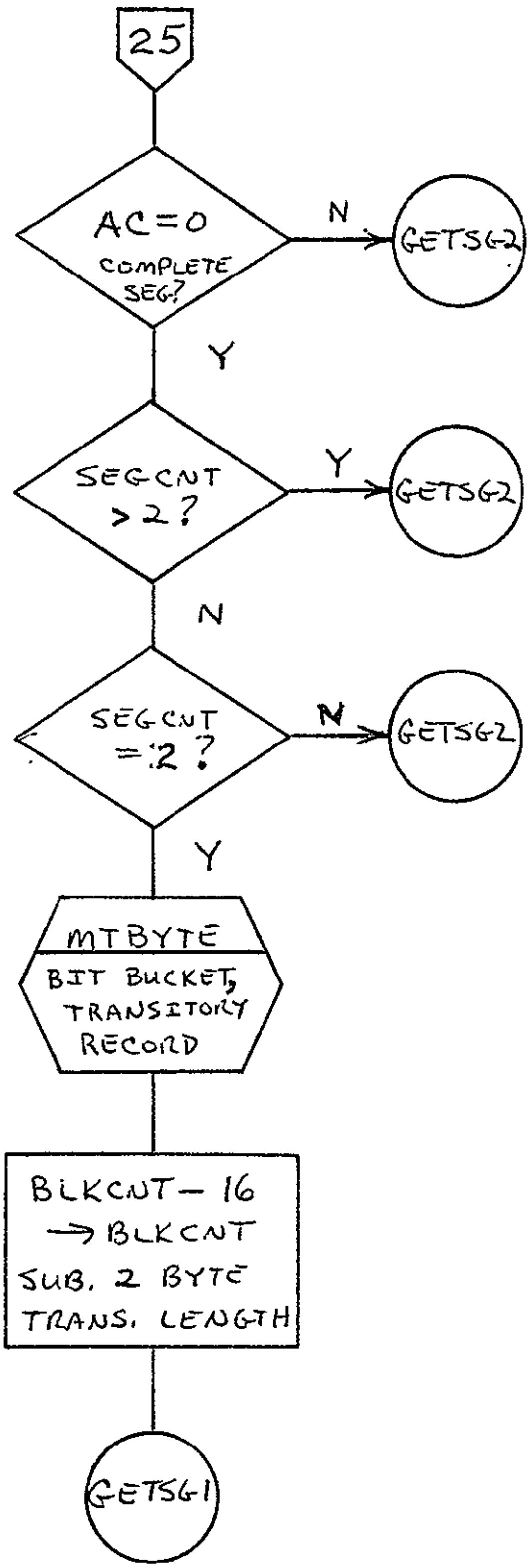

21
DRWVEC
OUTPUT VECTOR TO FILM
SETHD
PREVIOUS $X_2Y_2 = X_1Y_1$
1023 → YHD
0 → XHD
END COORD. FOR TOP VECTOR OF FORM
MAP
SCALE AND FRAME POSITION
SETTL
SET X_2Y_2 FR80 COORD.
DRWVEC
OUTPUT VECTOR TO FILM
22

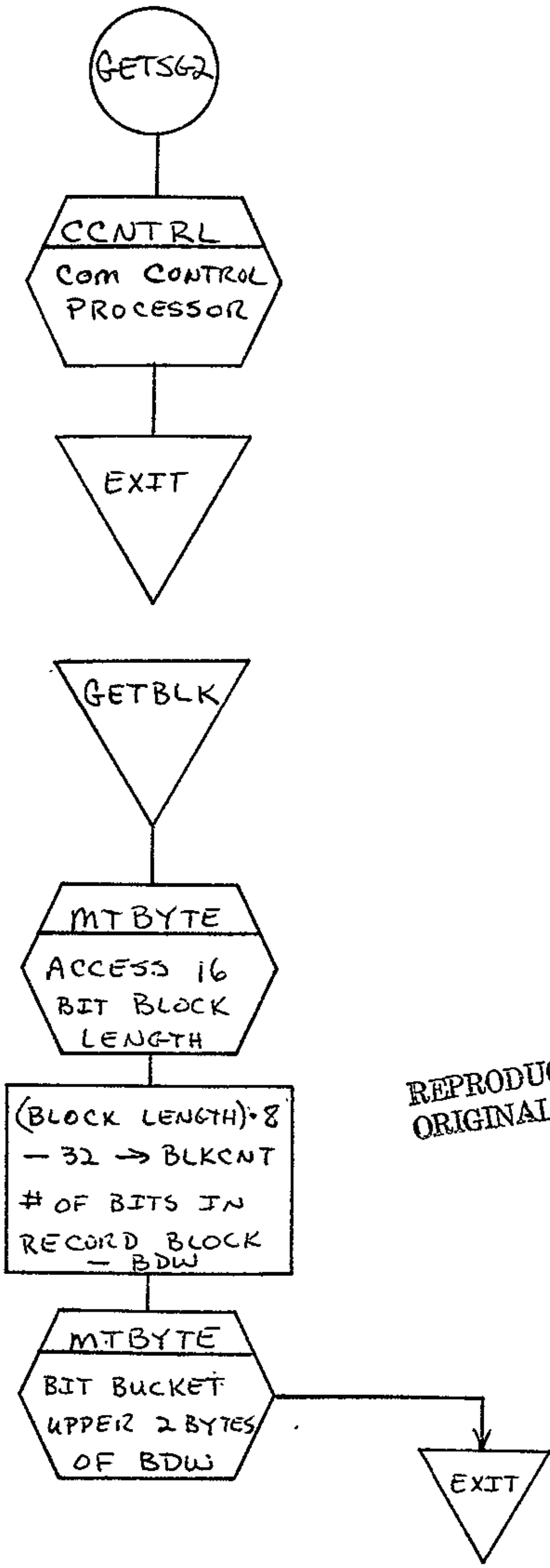

22
SETHD
PREVIOUS
$X_2 Y_2 = X_1 Y_1$
$0 \rightarrow XHD$
$0 \rightarrow YHD$
END COORD.
FOR LEFT VECTOR
MAP
SCALE AND
FRAME
POSITION
SETTL
SET $X_2 Y_2$
FR 80
COORD
DRWVEC
OUTPUT
VECTOR
TO FILM
EXIT

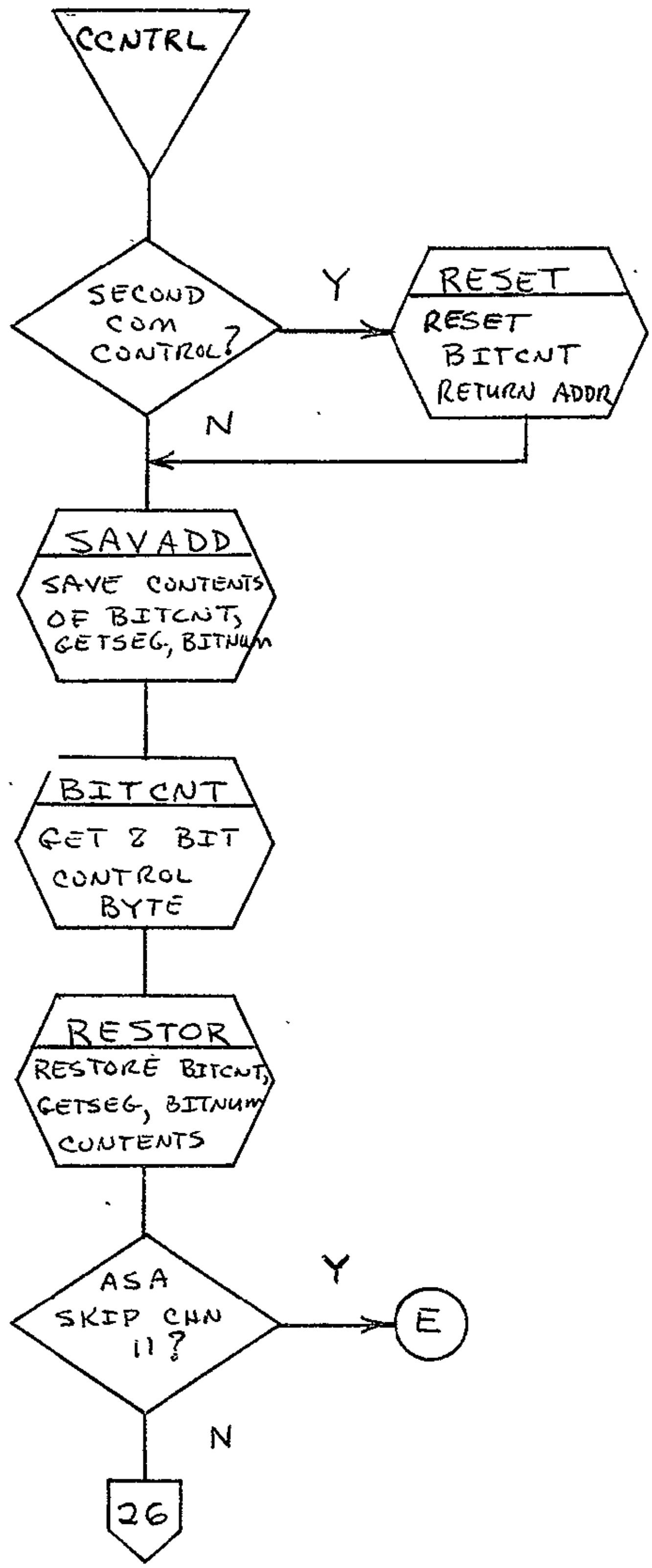

BITCNT
OF BITS REQUESTED BY GETT → BITNUM
TWO's COMP OF BITNUM → MBITNM: USED TO DECREMENT SEG. + BLKCNT
SEGCNT ≤ 0 NEED NEW SEGMENT?
Y
GETSEG
GET NEXT LOGICAL RECORD SEG.
N
BITNUM > SEGCNT?
Y
NEWSEG
N
MTBYTE
GET REQUIRED BITNUM FROM TAPE
23

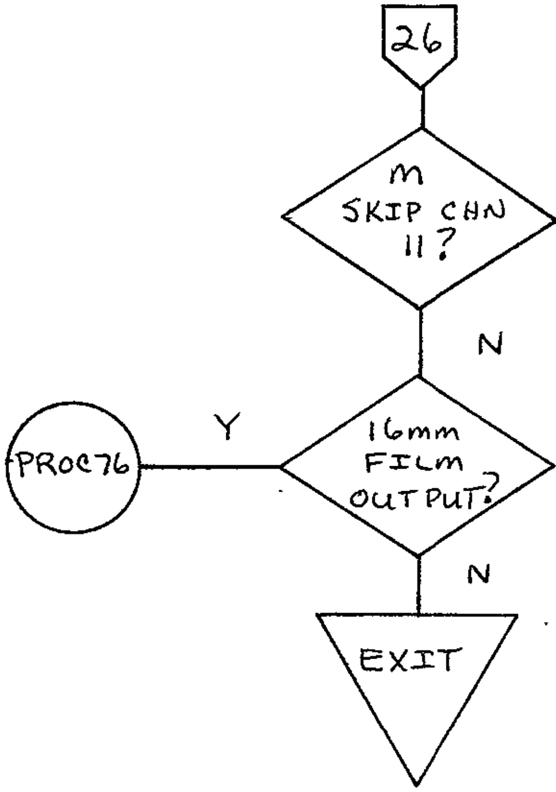

23
BLKCNT + MBITNM → BLKCNT & SET AC WITH REQUIRED BITS
EXIT
GETSEG
GETSG1
BLKCNT=0 NEED NEW BLOCK?
Y
GETBLK
GET NEW RECORD BLOCK
N
BLKCNT-32 → BLKCNT SUBT. 4 BYTE SDW LENGTH
24

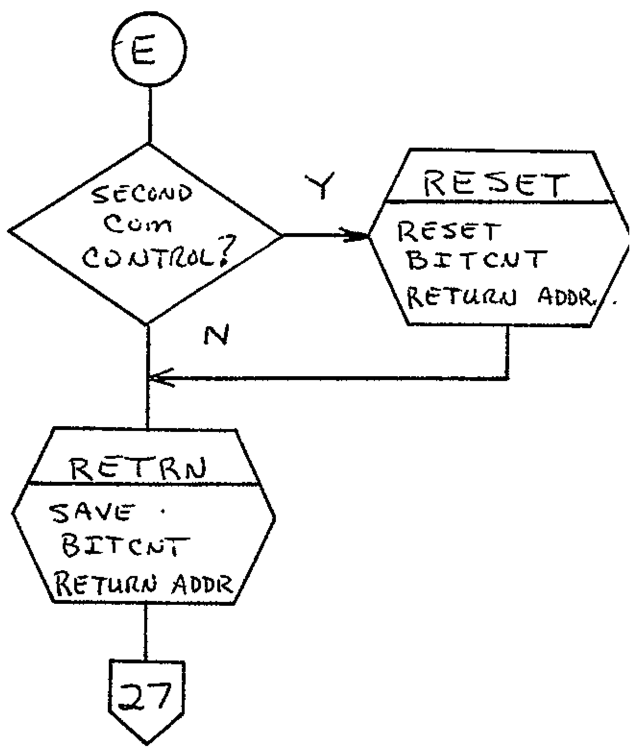

24
MTBYTE
ACCESS TWO BYTES OF SDW
SEGMENT LENGTH — 32 BIT SDW LENGTH → SEGCNT
MTBYTE
NEXT TWO BYTES OF SDW
ISOLATE SEGMENT CONTROL CODE IN AC
AC>1 START SEG?
Y
N
25
EXIT

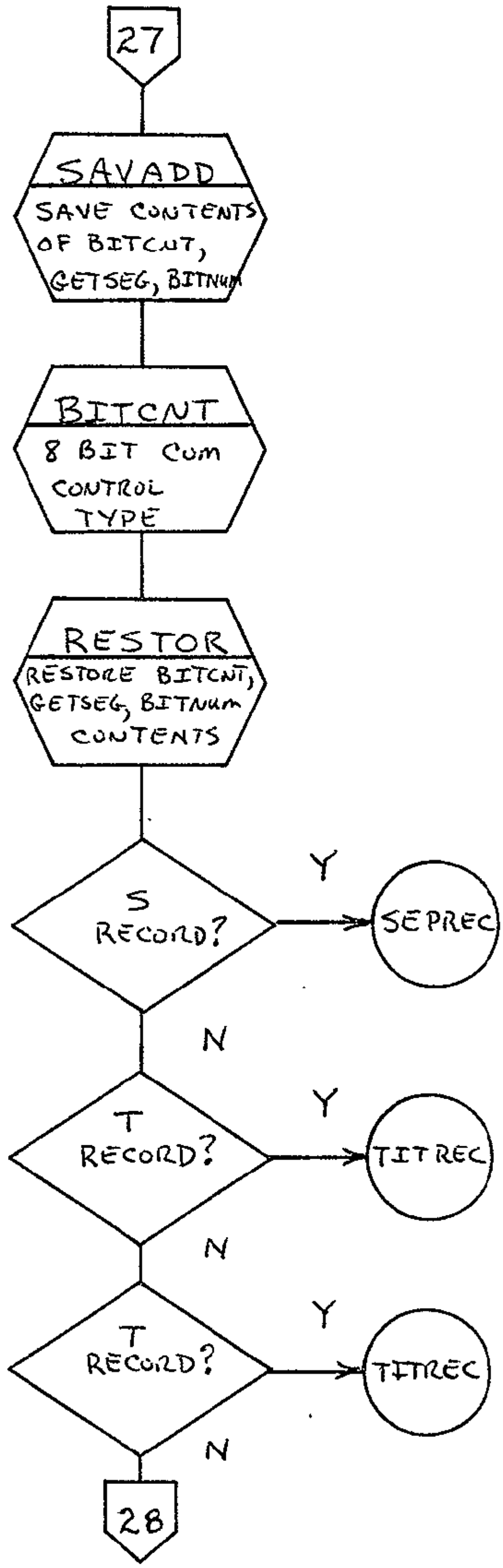

25
AC=0
COMPLETE SEG?
N
GETSG2
Y
SEGCNT >2?
Y
GETSG2
N
SEGCNT =2?
N
GETSG2
Y
MTBYTE
BIT BUCKET, TRANSITORY RECORD
BLKCNT-16 → BLKCNT
SUB. 2 BYTE TRANS. LENGTH
GETSG1

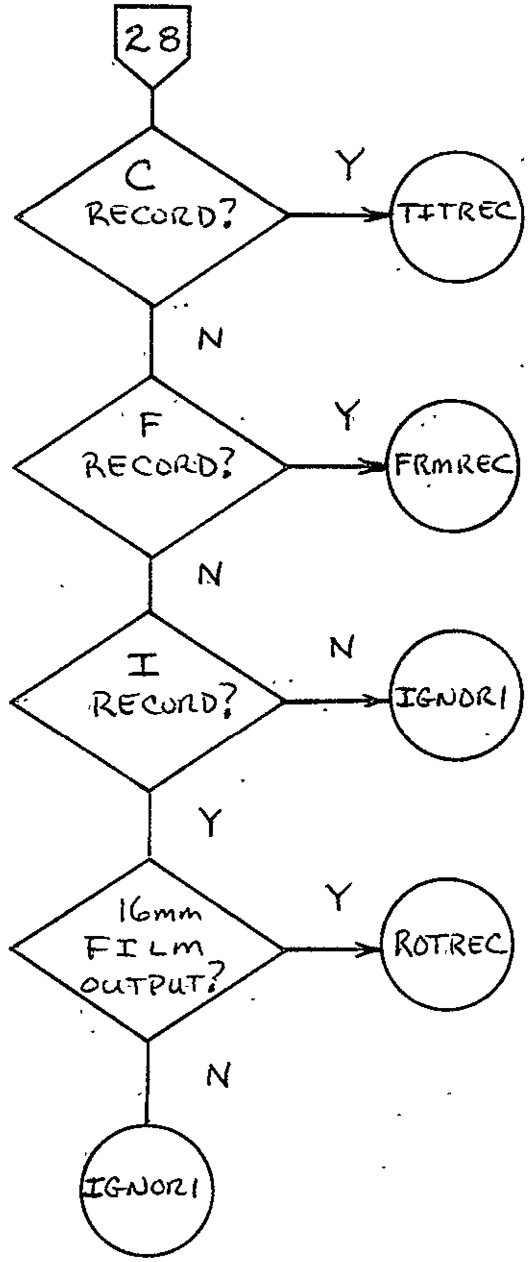

GETSG2
CCNTRL
COM CONTROL PROCESSOR
EXIT
GETBLK
MTBYTE
ACCESS 16 BIT BLOCK LENGTH
(BLOCK LENGTH)·8 − 32 → BLKCNT
OF BITS IN RECORD BLOCK − BDW
MTBYTE
BIT BUCKET UPPER 2 BYTES OF BDW
EXIT

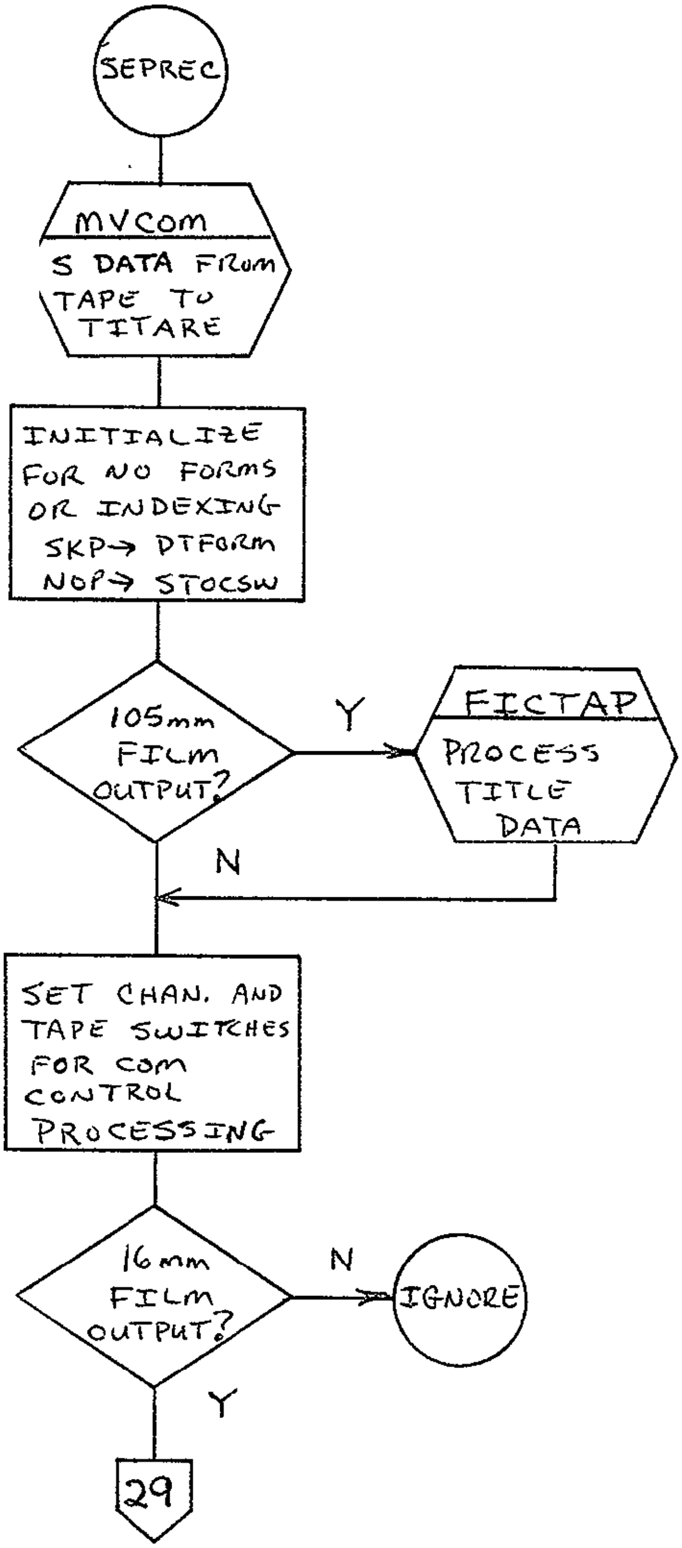

CONTRL
SECOND COM CONTROL?
Y
RESET
RESET BITCNT RETURN ADDR
N
SAVADD
SAVE CONTENTS OF BITCNT, GETSEG, BITNUM
BITCNT
GET 8 BIT CONTROL BYTE
RESTOR
RESTORE BITCNT, GETSEG, BITNUM CONTENTS
ASA SKIP CHN 11?
Y
E
N
26

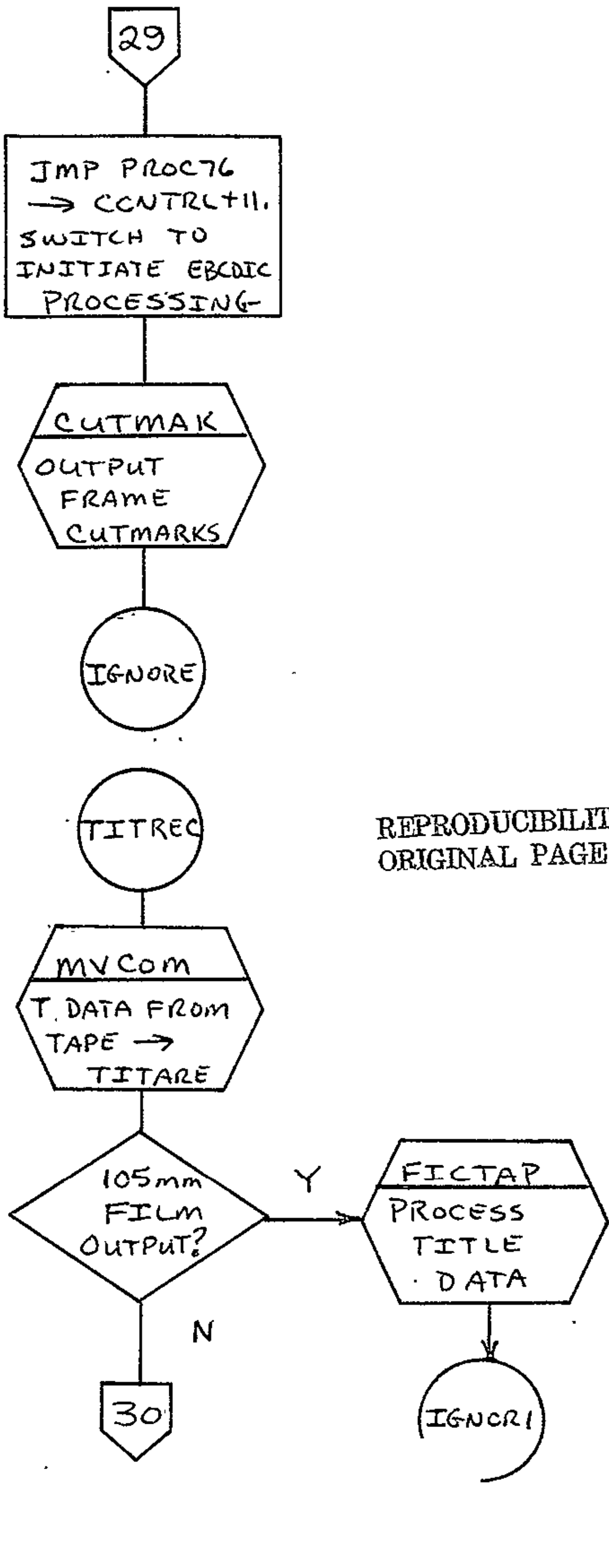

26
M SKIP CHN 11?
Y
E
N
16mm FILM OUTPUT?
Y
PROC76
N
EXIT

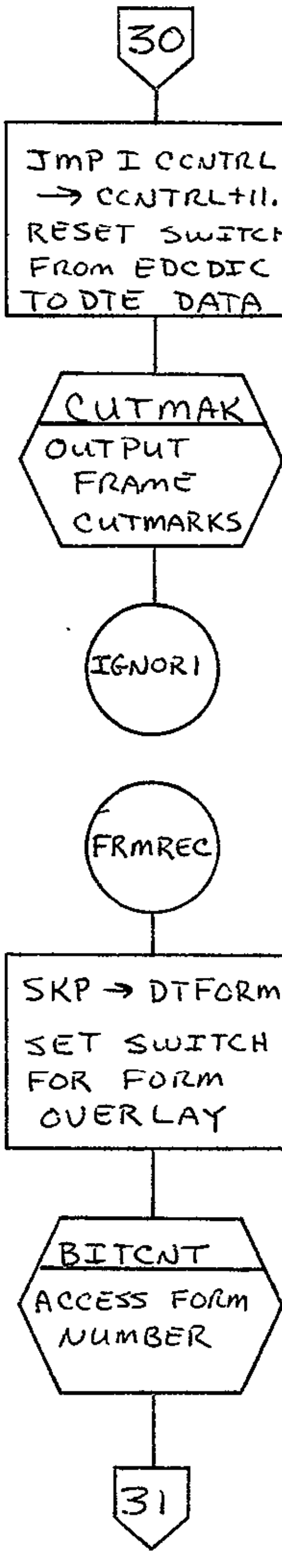

E
SECOND COM CONTROL?
Y
RESET
RESET BITCNT RETURN ADDR.
N
RETRN
SAVE BITCNT RETURN ADDR
27

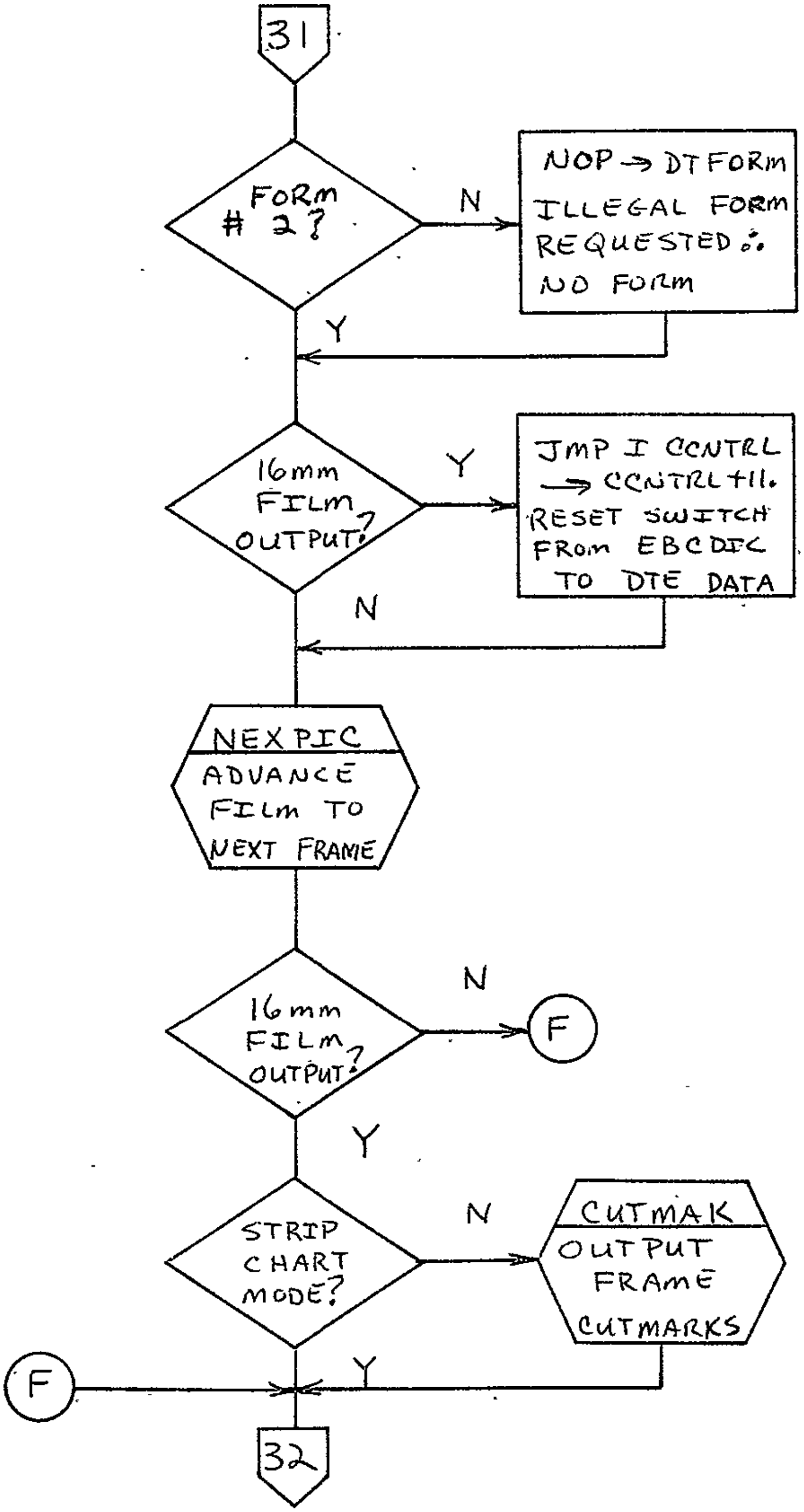

27
SAVADD
SAVE CONTENTS OF BITCNT, GETSEG, BITNUM
BITCNT
8 BIT COM CONTROL TYPE
RESTOR
RESTORE BITCNT, GETSEG, BITNUM CONTENTS
S RECORD?
Y
SEPREC
N
T RECORD?
Y
TITREC
N
T RECORD?
Y
TFTREC
N
28

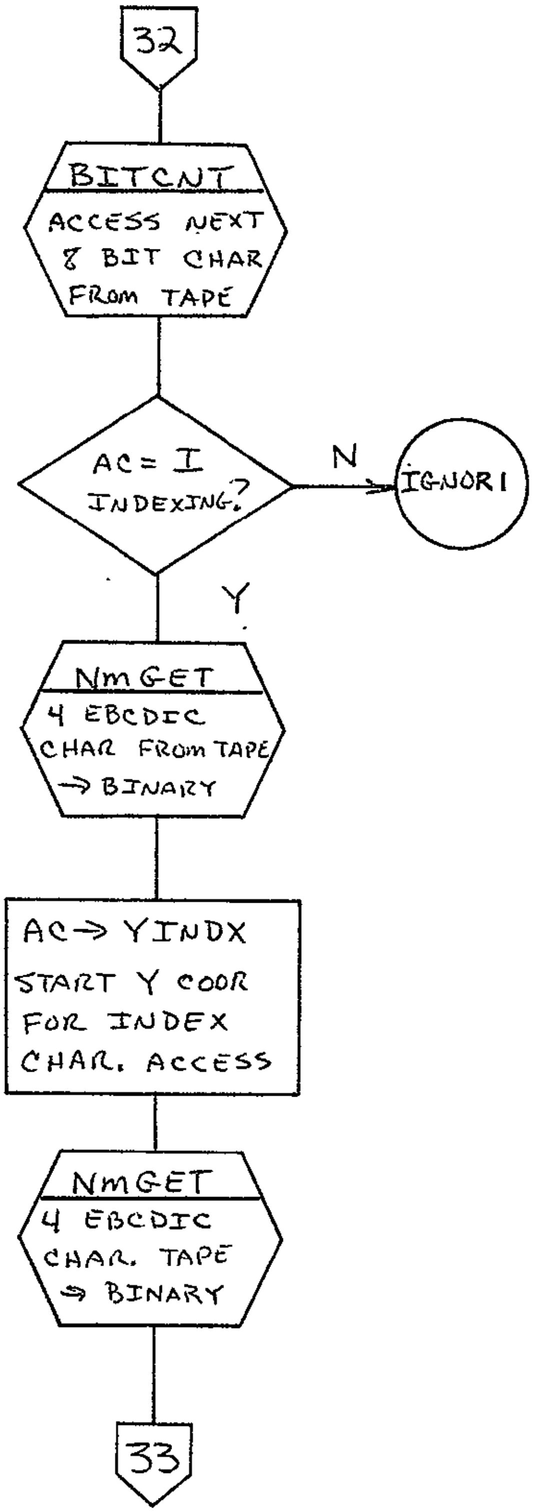

28
C RECORD?
Y
TFTREC
N
F RECORD?
Y
FRMREC
N
I RECORD?
N
IGNOR1
Y
16mm FILM OUTPUT?
Y
ROTREC
N
IGNOR1

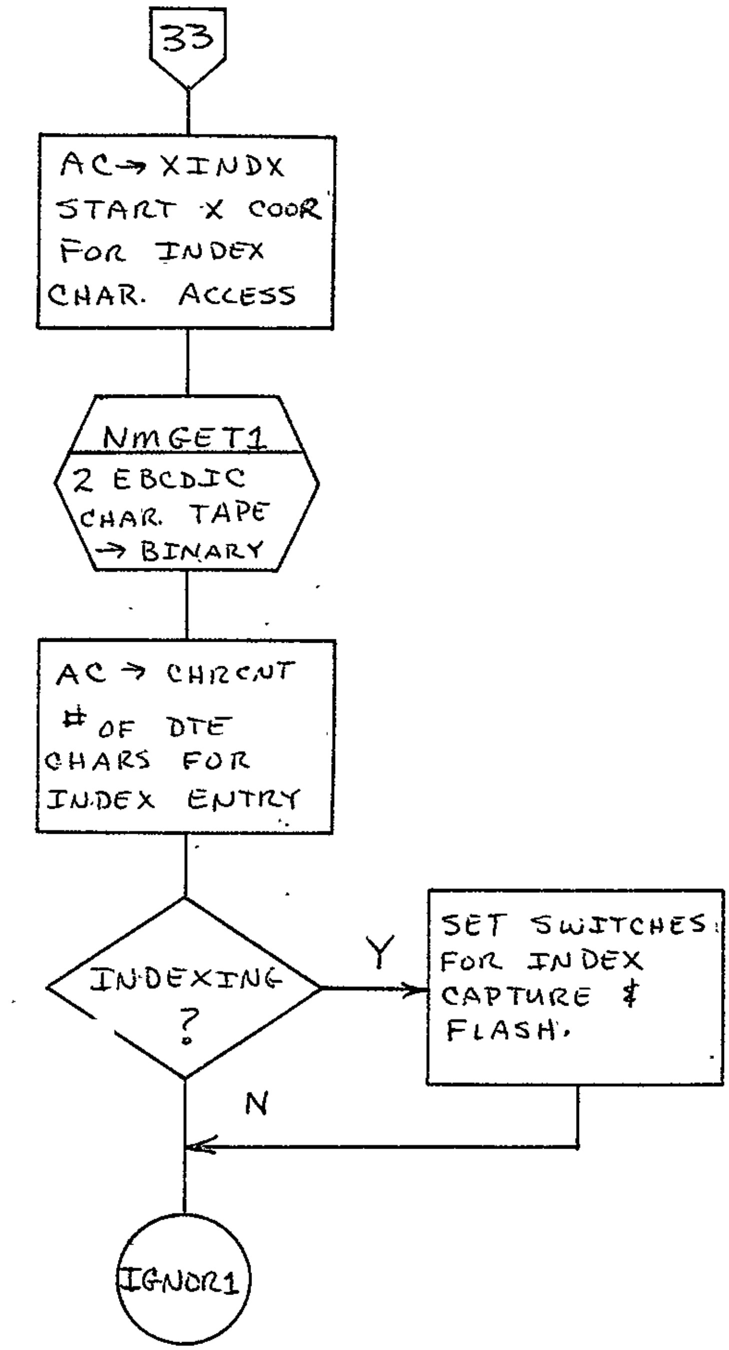

SEPREC
MVCOM
S DATA FROM TAPE TO TITARE
INITIALIZE FOR NO FORMS OR INDEXING
SKP→ DTFORM
NOP→ STOCSW
105mm FILM OUTPUT?
Y
FICTAP
PROCESS TITLE DATA
N
SET CHAN. AND TAPE SWITCHES FOR COM CONTROL PROCESSING
16mm FILM OUTPUT?
N
IGNORE
Y
29

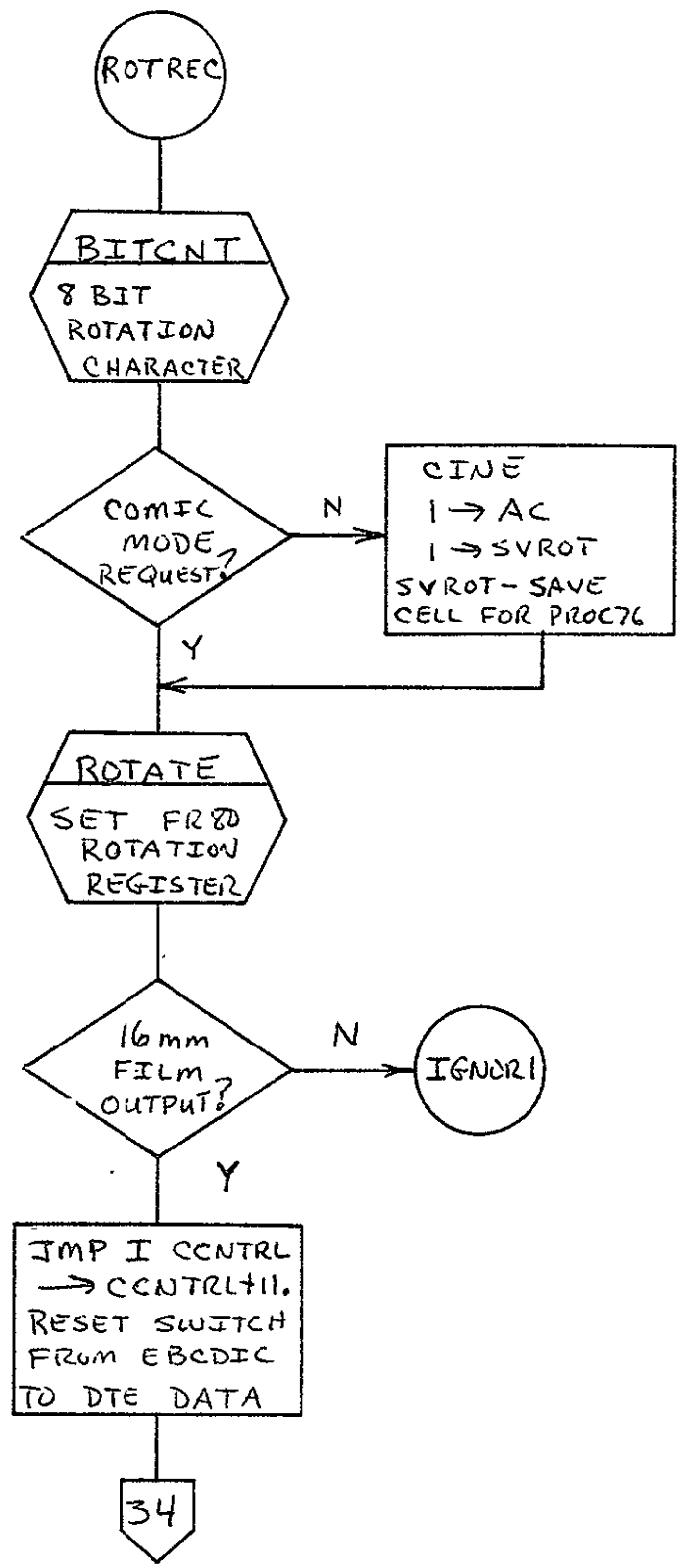

29
JMP PROC76
→ CONTRL+11.
SWITCH TO
INITIATE EBCDIC
PROCESSING
CUTMAK
OUTPUT
FRAME
CUTMARKS
IGNORE
TITREC
MVCOM
T. DATA FROM
TAPE →
TITARE
105mm
FILM
OUTPUT?
Y
N
FICTAP
PROCESS
TITLE
DATA
30
IGNCR1

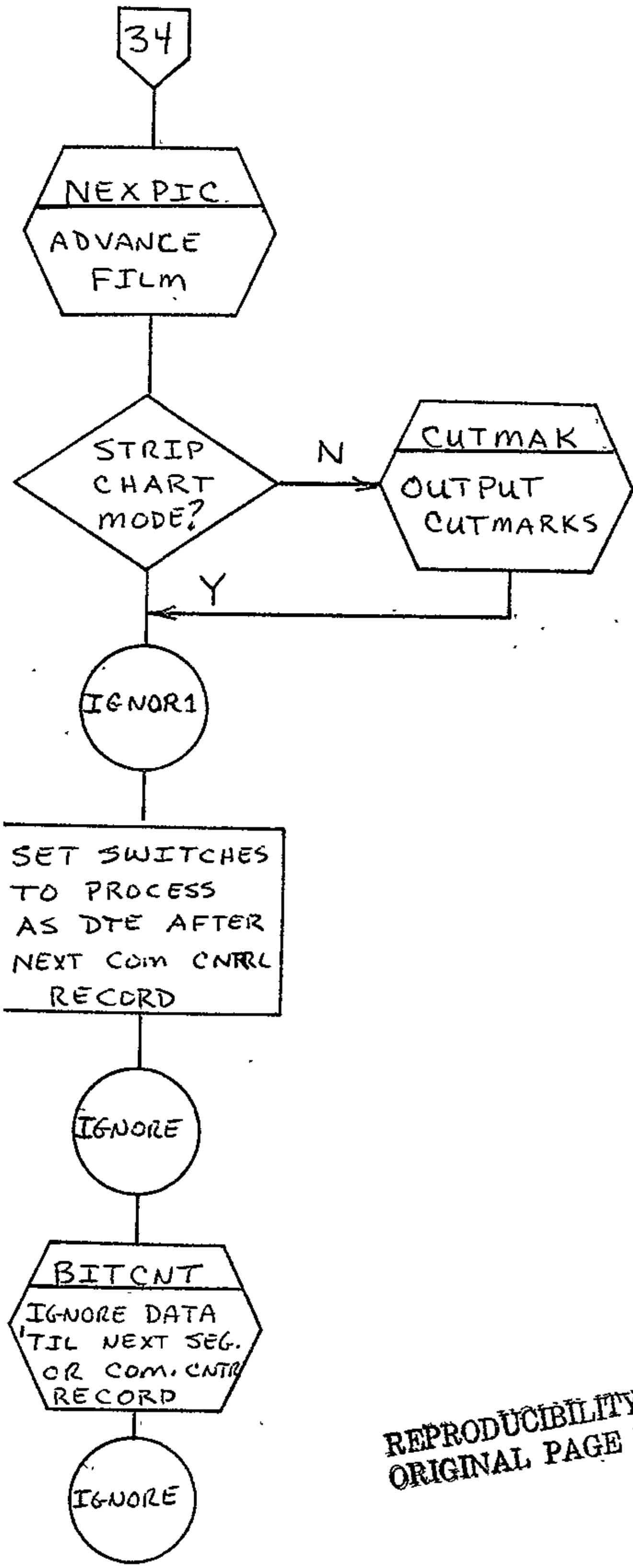

30
JMP I CCNTRL
→ CCNTRL+11.
RESET SWITCH
FROM EDCDIC
TO DTE DATA
CUTMAK
OUTPUT
FRAME
CUTMARKS
IGNORI
FRMREC
SKP → DTFORM
SET SWITCH
FOR FORM
OVERLAY
BITCNT
ACCESS FORM
NUMBER
31

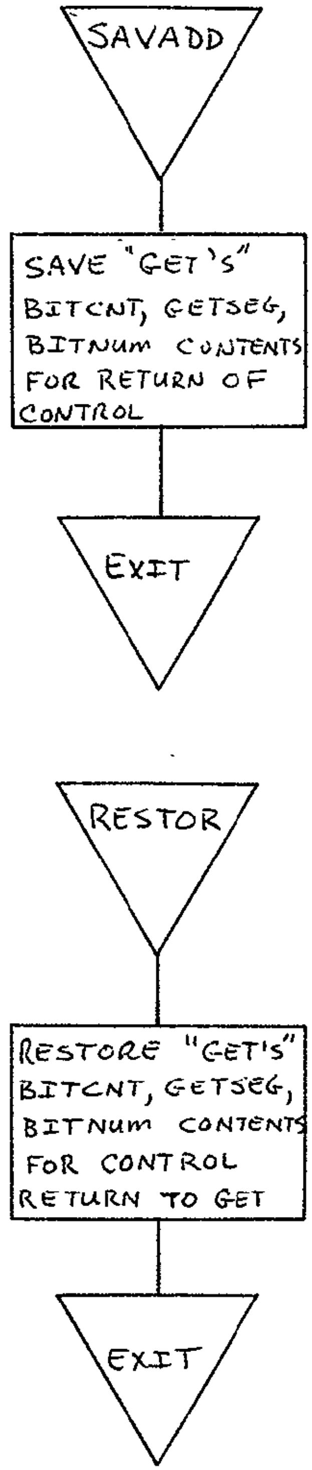

31
FORM # 2?
N
NOP → DTFORM
ILLEGAL FORM
REQUESTED ∴
NO FORM
Y
16mm FILM OUTPUT?
Y
JMP I CCNTRL
→ CCNTRL+1.
RESET SWITCH
FROM EBCDIC
TO DTE DATA
N
NEXPIC
ADVANCE FILM TO NEXT FRAME
16mm FILM OUTPUT?
N
F
Y
STRIP CHART MODE?
N
CUTMAK
OUTPUT FRAME CUTMARKS
Y
F
32

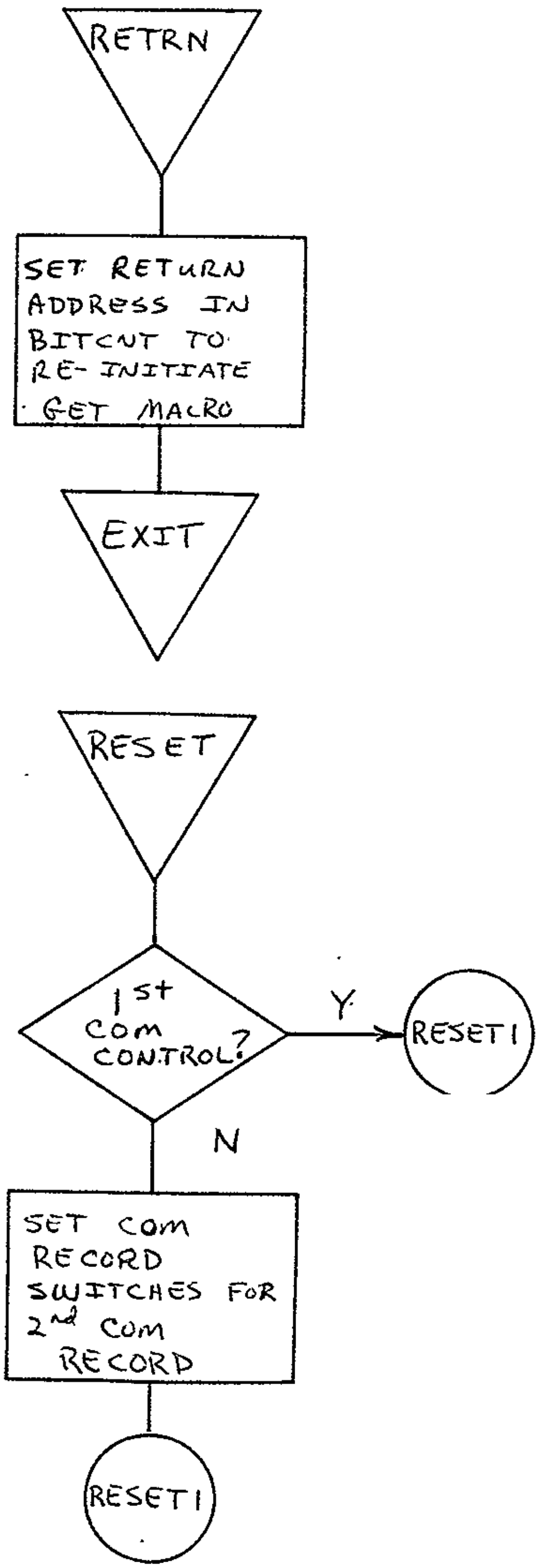

32
BITCNT
ACCESS NEXT 8 BIT CHAR FROM TAPE
AC = I INDEXING?
N
IGNORI
Y
NmGET
4 EBCDIC CHAR FROM TAPE → BINARY
AC → YINDX
START Y COOR FOR INDEX CHAR. ACCESS
NmGET
4 EBCDIC CHAR. TAPE → BINARY
33

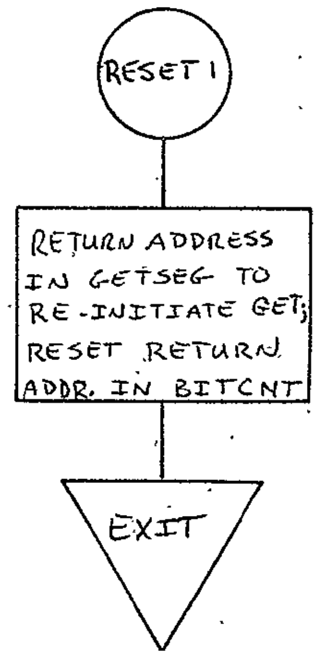

33
AC → XINDX
START X COOR
FOR INDEX
CHAR. ACCESS
NMGET1
2 EBCDIC
CHAR. TAPE
→ BINARY
AC → CHRCNT
OF DTE
CHARS FOR
INDEX ENTRY
INDEXING
?
Y
SET SWITCHES
FOR INDEX
CAPTURE &
FLASH.
N
IGNOR1

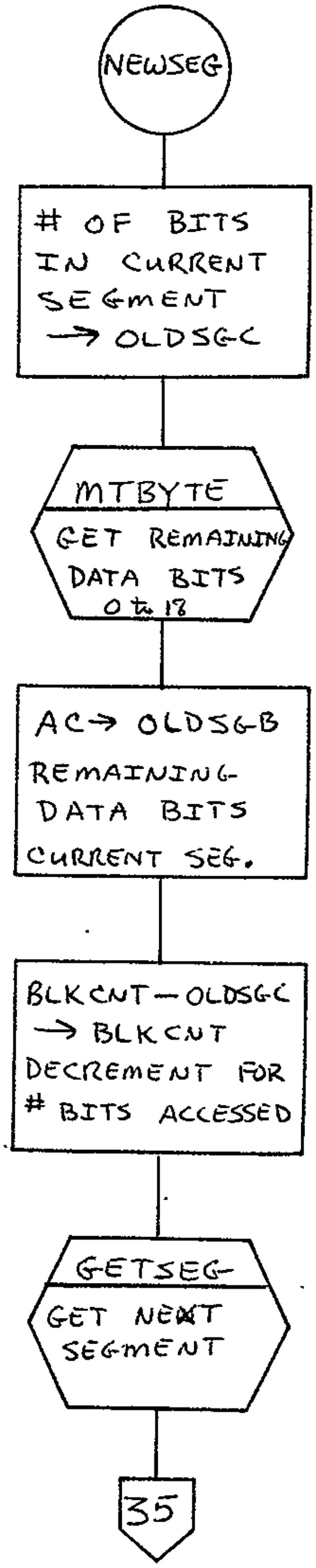

ROTREC
BITCNT
8 BIT ROTATION CHARACTER
COMIC MODE REQUEST?
N
CINE
1 → AC
1 → SVROT
SVROT - SAVE CELL FOR PROC76
Y
ROTATE
SET FR80 ROTATION REGISTER
16mm FILM OUTPUT?
N
IGNOR1
Y
JMP I CONTRL → CONTRL+11.
RESET SWITCH FROM EBCDIC TO DTE DATA
34

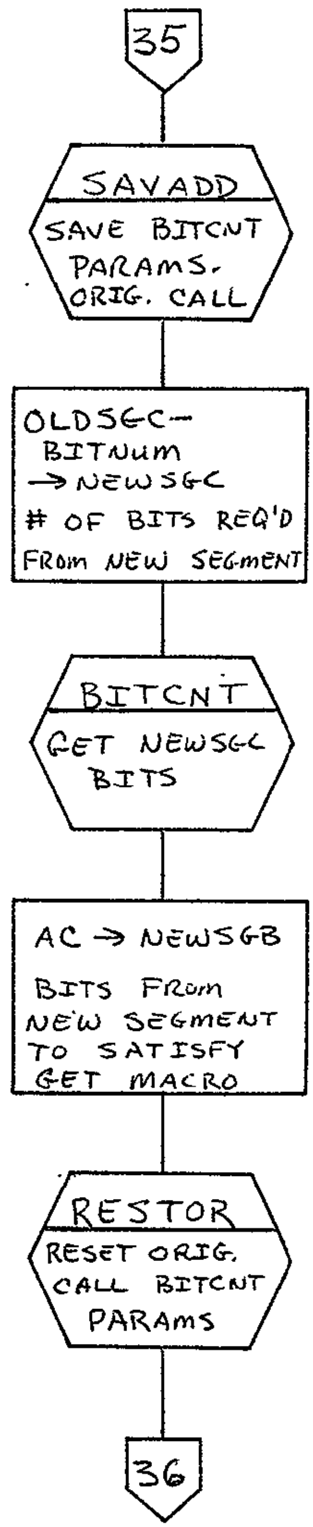

34
NEXPIC
ADVANCE FILM
STRIP CHART MODE?
N
CUTMAK
OUTPUT CUTMARKS
Y
IGNOR1
SET SWITCHES TO PROCESS AS DTE AFTER NEXT COM CNTRL RECORD
IGNORE
BITCNT
IGNORE DATA 'TIL NEXT SEG. OR COM. CNTR RECORD
IGNORE

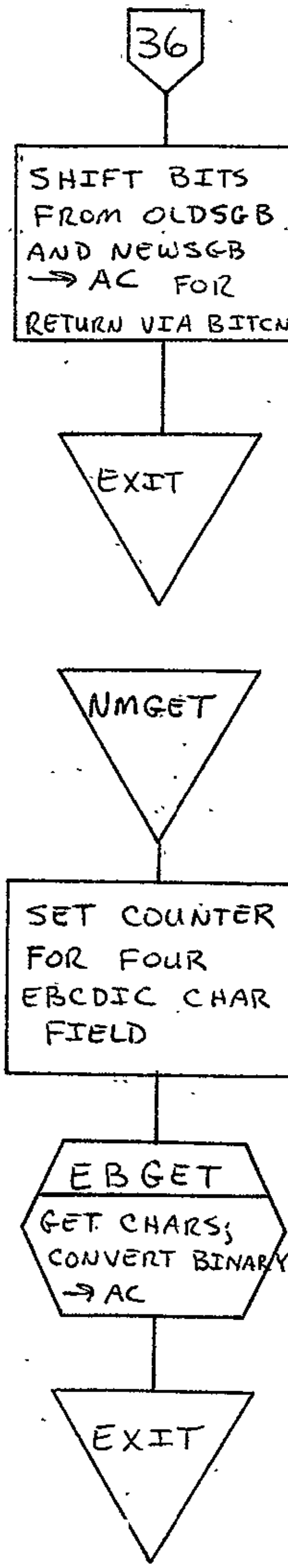

SAVADD
SAVE "GET'S" BITCNT, GETSEG, BITNUM CONTENTS FOR RETURN OF CONTROL
EXIT
RESTOR
RESTORE "GET'S" BITCNT, GETSEG, BITNUM CONTENTS FOR CONTROL RETURN TO GET
EXIT


RETRN
SET RETURN ADDRESS IN BITCNT TO RE-INITIATE GET MACRO
EXIT
RESET
1st COM CONTROL?
Y
RESET1
N
SET COM RECORD SWITCHES FOR 2nd COM RECORD
RESET1

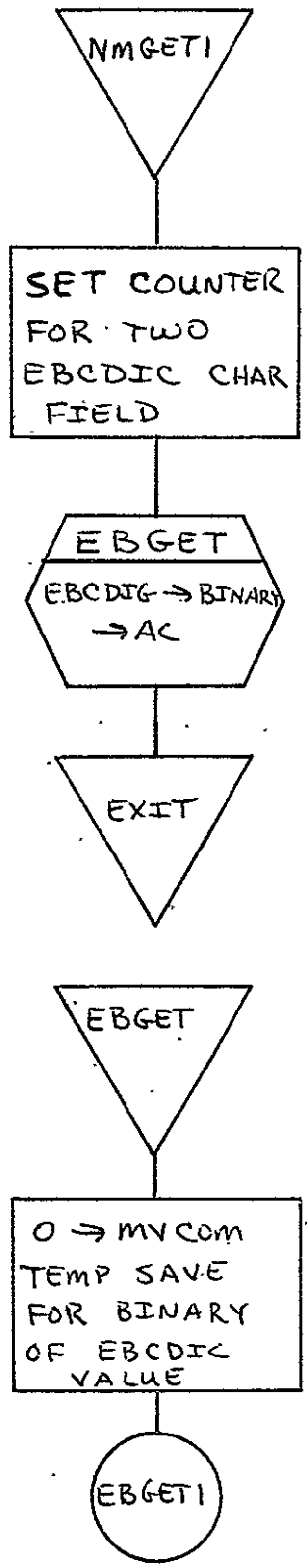

RESET 1
RETURN ADDRESS IN GETSEG TO RE-INITIATE GET; RESET RETURN ADDR. IN BITCNT
EXIT

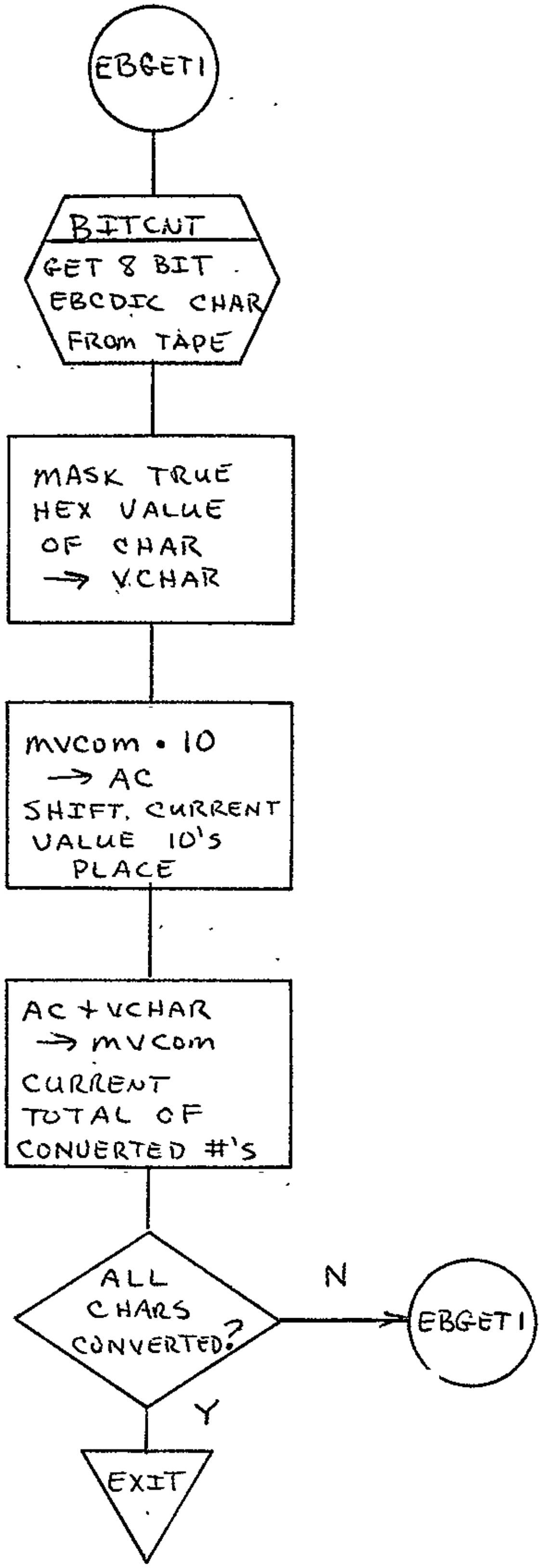

NEWSEG
OF BITS IN CURRENT SEGMENT → OLDSGC
MTBYTE
GET REMAINING DATA BITS 0 to 17
AC → OLDSGB REMAINING DATA BITS CURRENT SEG.
BLKCNT — OLDSGC → BLKCNT DECREMENT FOR # BITS ACCESSED
GETSEG
GET NEXT SEGMENT
35

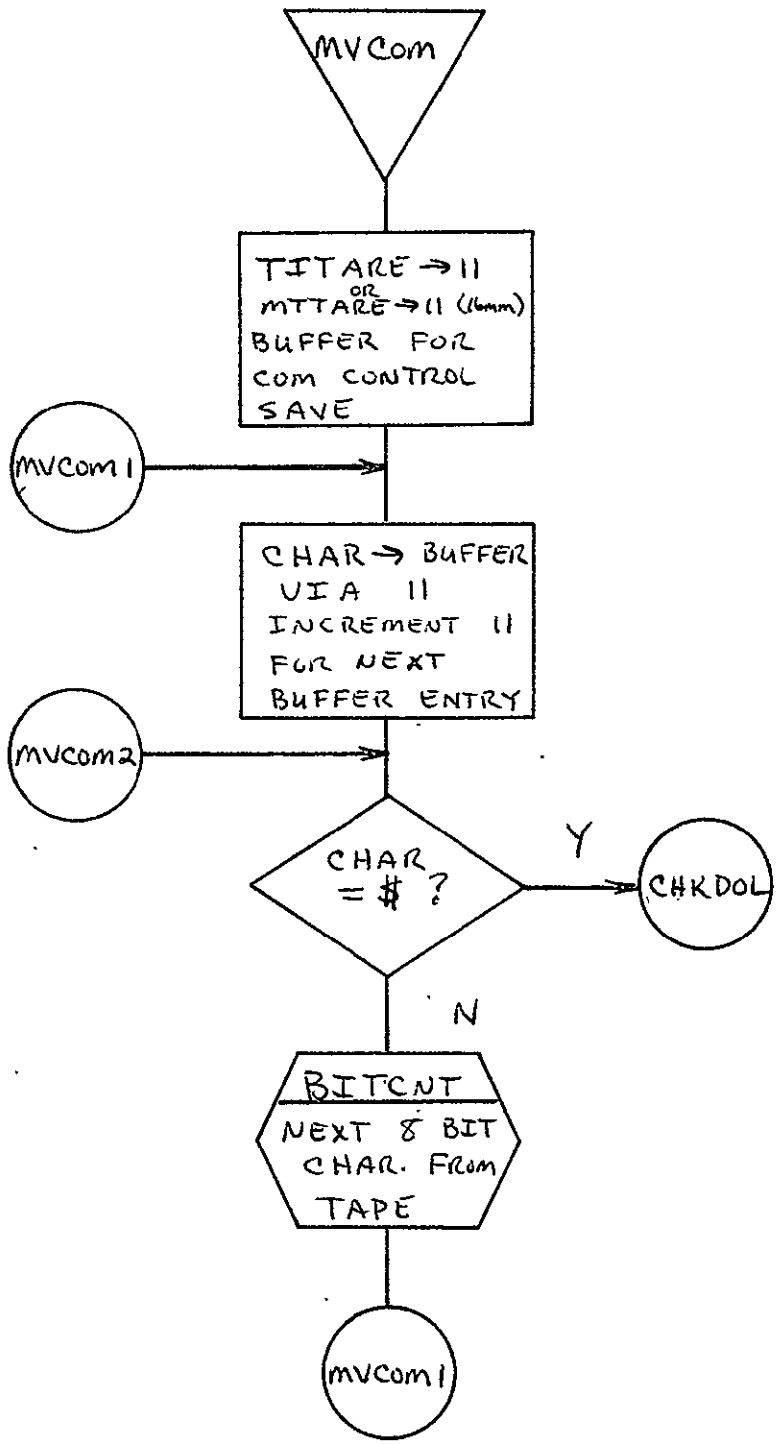

35
SAVADD
SAVE BITCNT PARAMS. ORIG. CALL
OLDSGC-BITNUM →NEWSGC
OF BITS REQ'D FROM NEW SEGMENT
BITCNT
GET NEWSGC BITS
AC → NEWSGB
BITS FROM NEW SEGMENT TO SATISFY GET MACRO
RESTOR
RESET ORIG. CALL BITCNT PARAMS
36

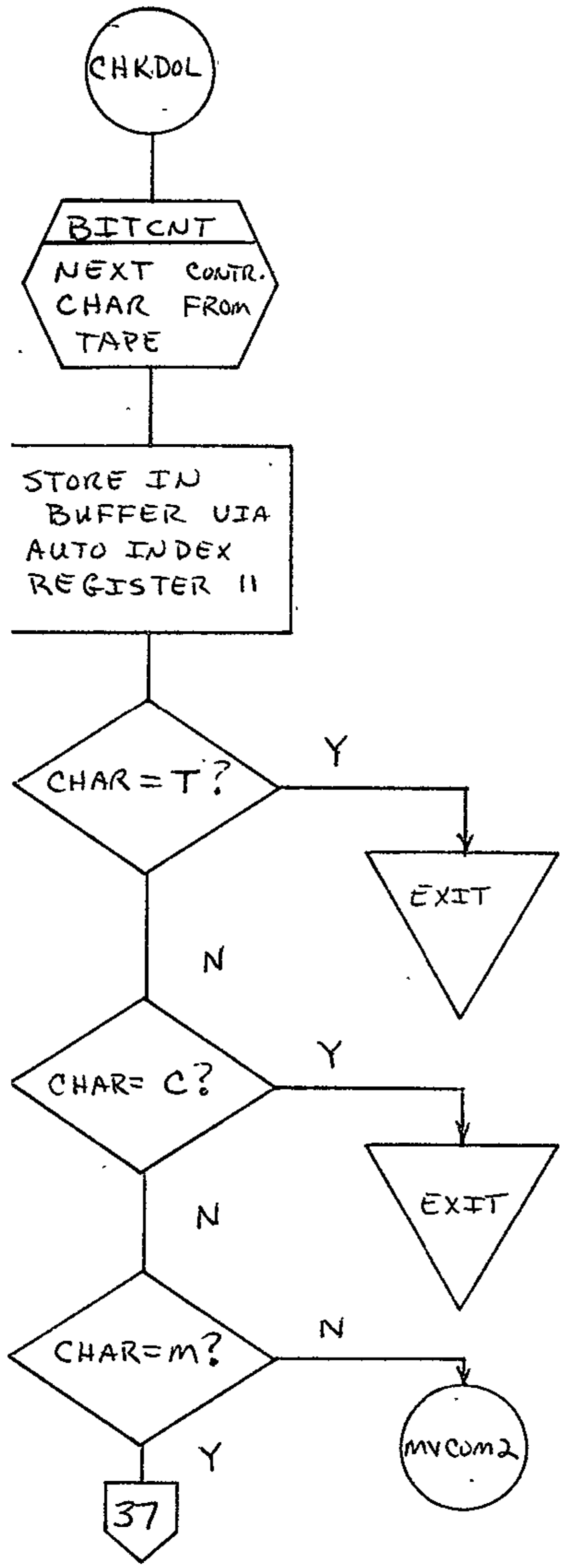


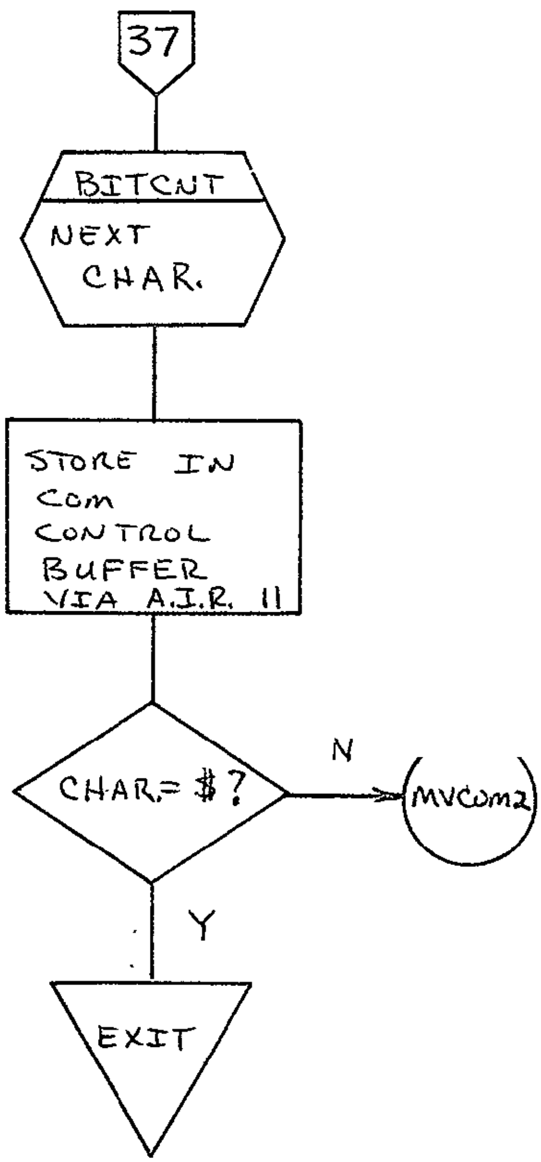
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

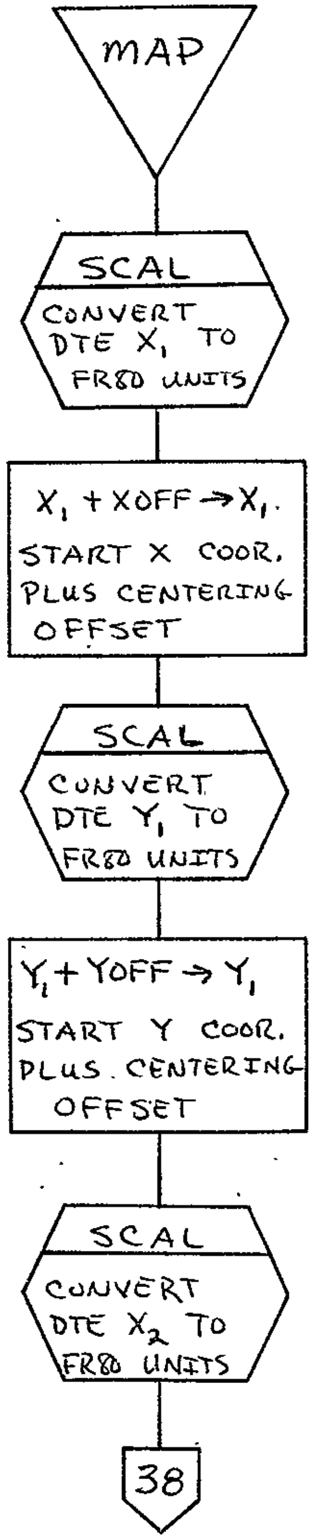

NMGETI
SET COUNTER FOR TWO EBCDIC CHAR FIELD
EBGET
EBCDIC → BINARY → AC
EXIT
EBGET
0 → MVCOM TEMP SAVE FOR BINARY OF EBCDIC VALUE
EBGETI

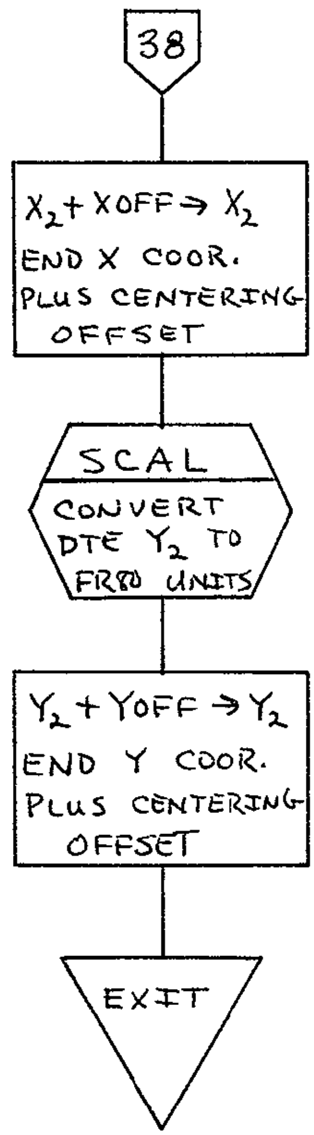

EBGETI
BITCNT
GET 8 BIT
EBCDIC CHAR
FROM TAPE
MASK TRUE
HEX VALUE
OF CHAR
→ V.CHAR
mvcom • 10
→ AC
SHIFT. CURRENT
VALUE 10'S
PLACE
AC + VCHAR
→ mvcom
CURRENT
TOTAL OF
CONVERTED #'S
ALL
CHARS
CONVERTED?
N
EBGETI
Y
EXIT

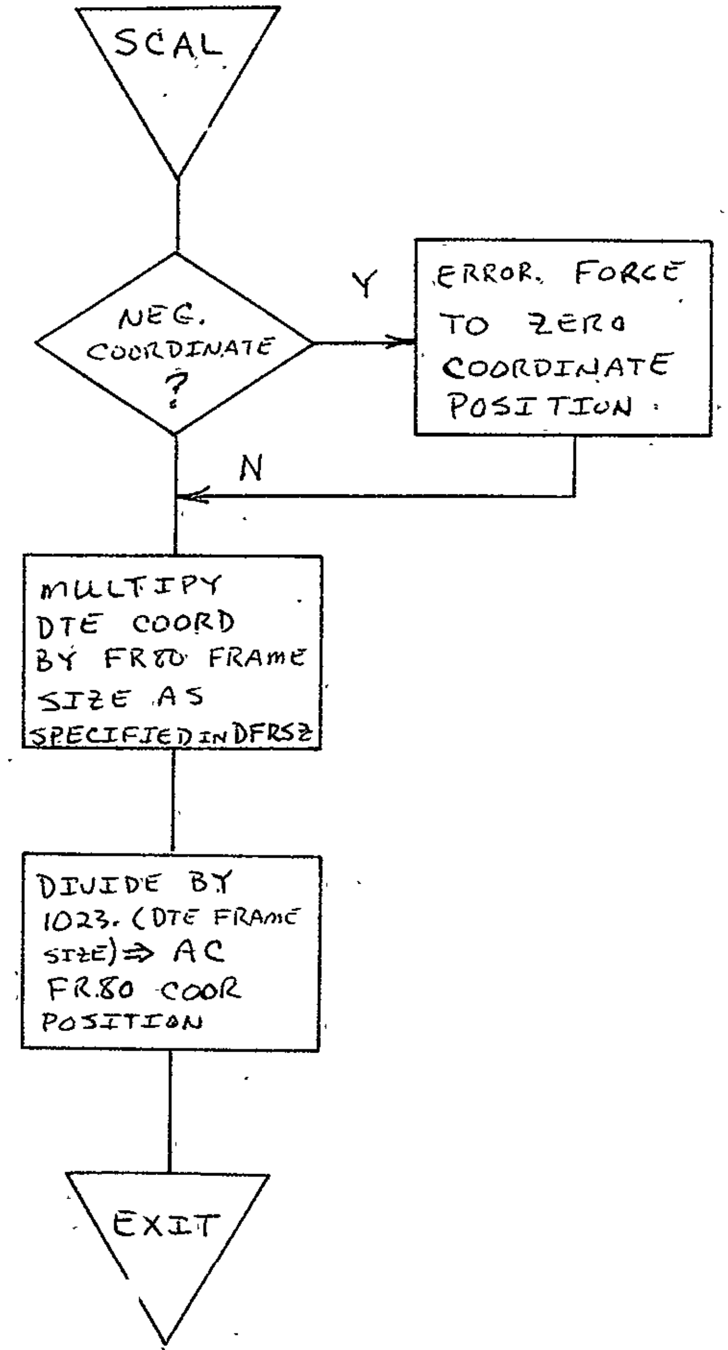

MVCom
TITARE → I1
OR
MTTARE → I1 (16mm)
BUFFER FOR
COM CONTROL
SAVE
MVCOM1
CHAR → BUFFER
VIA I1
INCREMENT I1
FOR NEXT
BUFFER ENTRY
MVCOM2
CHAR = $?
Y
CHKDOL
N
BITCNT
NEXT 8 BIT
CHAR. FROM
TAPE
MVCOM1

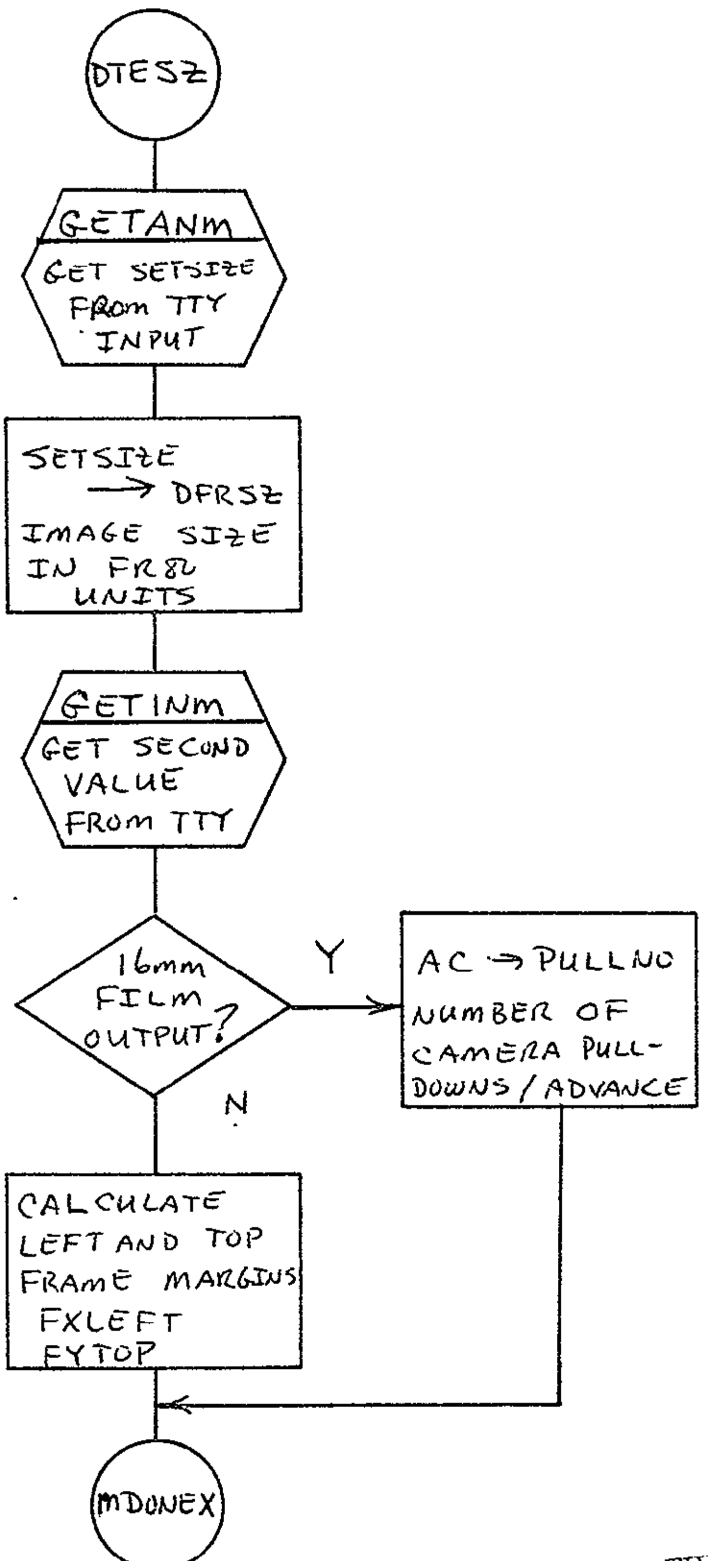

CHKDOL
BITCNT
NEXT CONTR. CHAR FROM TAPE
STORE IN BUFFER VIA AUTO INDEX REGISTER 11
CHAR = T?
Y
EXIT
N
CHAR = C?
Y
EXIT
N
CHAR = M?
N
MVCOM2
Y
37

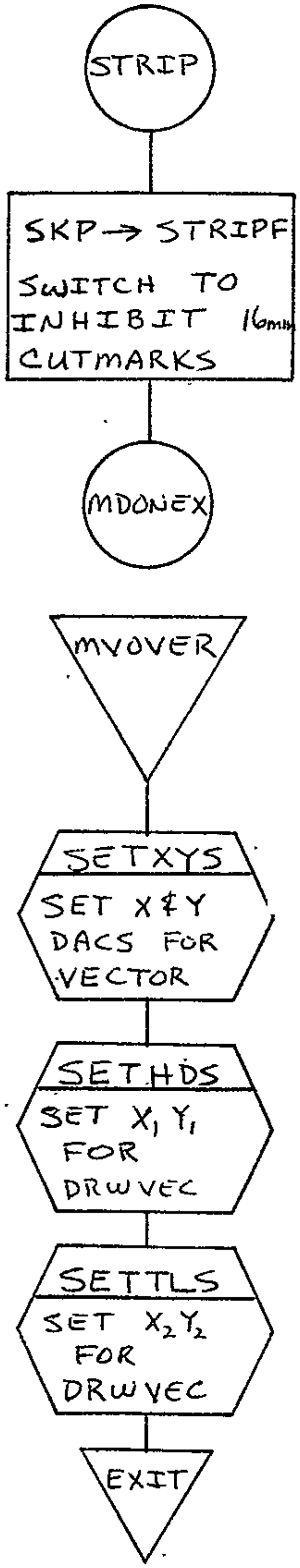

37
BITCNT
NEXT CHAR.
STORE IN COM CONTROL BUFFER VIA A.I.R. 11
CHAR.= $?
N
MVCOM2
Y
EXIT

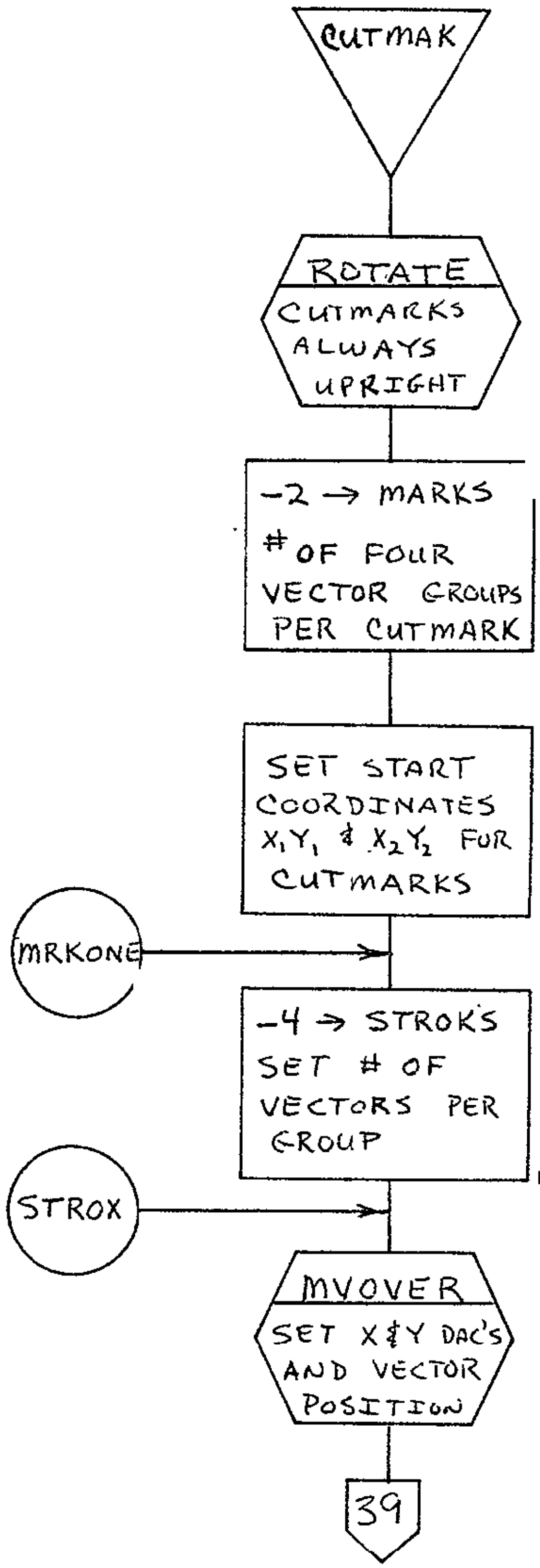

MAP
SCAL
CONVERT DTE X1 TO FR80 UNITS
X1 + XOFF → X1.
START X COOR. PLUS CENTERING OFFSET
SCAL
CONVERT DTE Y1 TO FR80 UNITS
Y1 + YOFF → Y1
START Y COOR. PLUS CENTERING OFFSET
SCAL
CONVERT DTE X2 TO FR80 UNITS
38

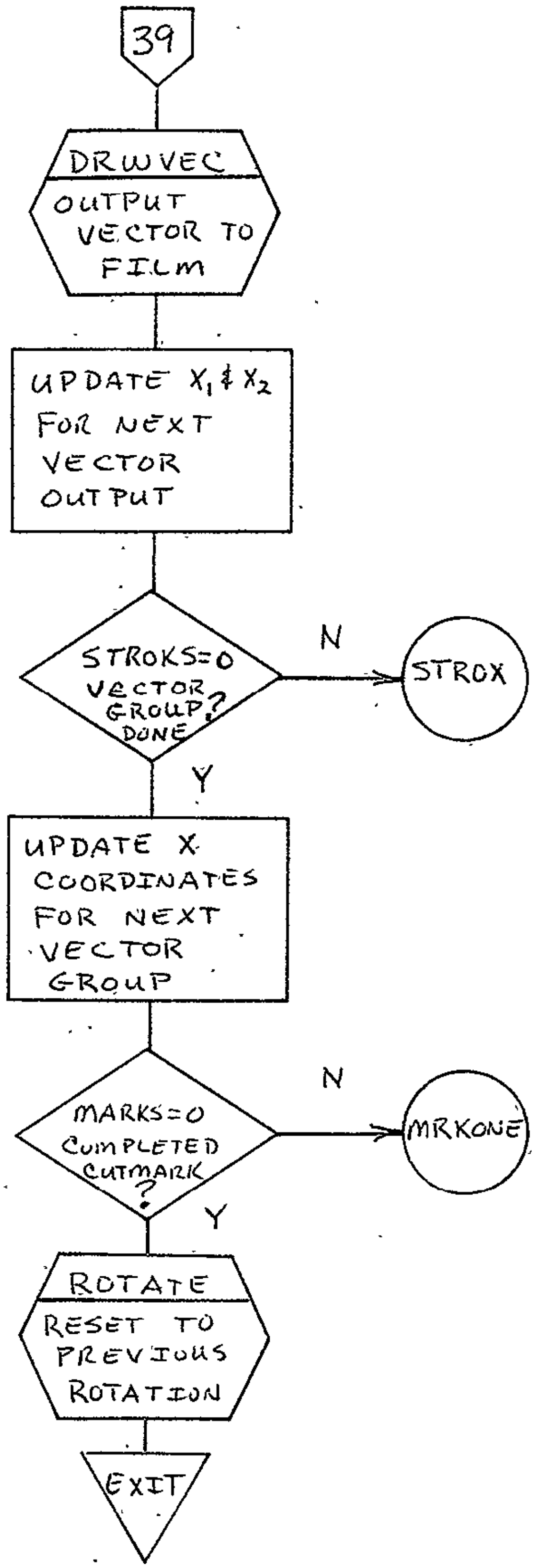

38
X2 + XOFF → X2
END X COOR.
PLUS CENTERING
OFFSET
SCAL
CONVERT
DTE Y2 TO
FR80 UNITS
Y2 + YOFF → Y2
END Y COOR.
PLUS CENTERING
OFFSET
EXIT

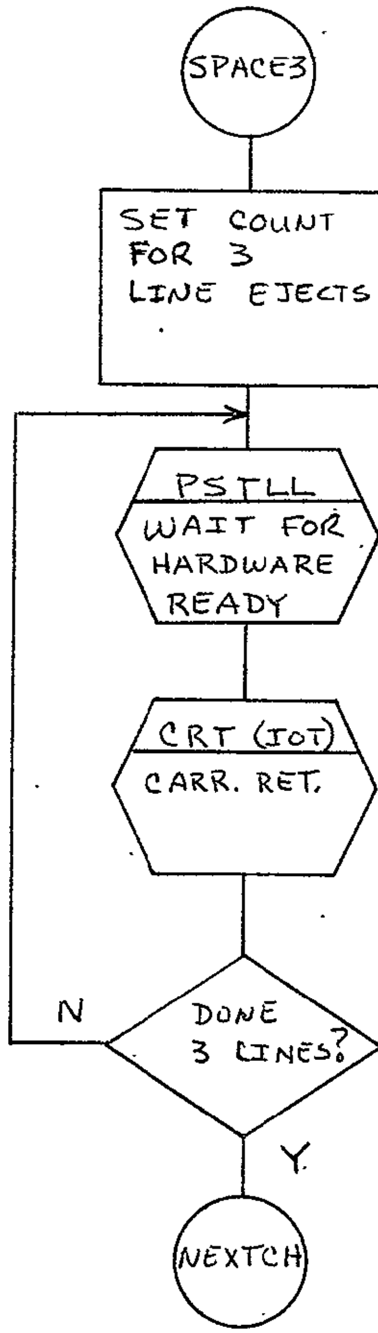

SCAL
NEG. COORDINATE ?
Y
ERROR. FORCE TO ZERO COORDINATE POSITION.
N
MULTIPY DTE COORD BY FR80 FRAME SIZE AS SPECIFIED IN DFRSZ
DIVIDE BY 1023. (DTE FRAME SIZE) ⇒ AC FR80 COOR POSITION
EXIT

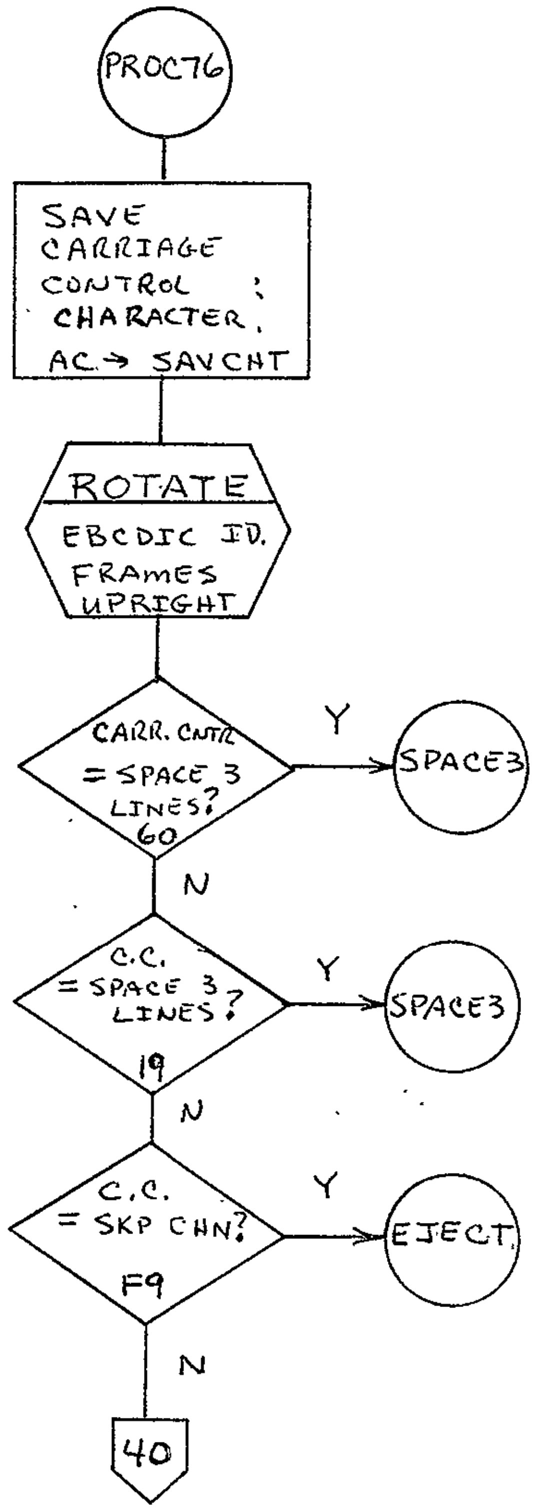

DTESZ
GETANM
GET SETSIZE FROM TTY INPUT
SETSIZE → DFRSZ
IMAGE SIZE IN FR80 UNITS
GETINM
GET SECOND VALUE FROM TTY
16mm FILM OUTPUT?
Y
AC → PULLNO
NUMBER OF CAMERA PULL-DOWNS / ADVANCE
N
CALCULATE LEFT AND TOP FRAME MARGINS
FXLEFT
FYTOP
MDONEX

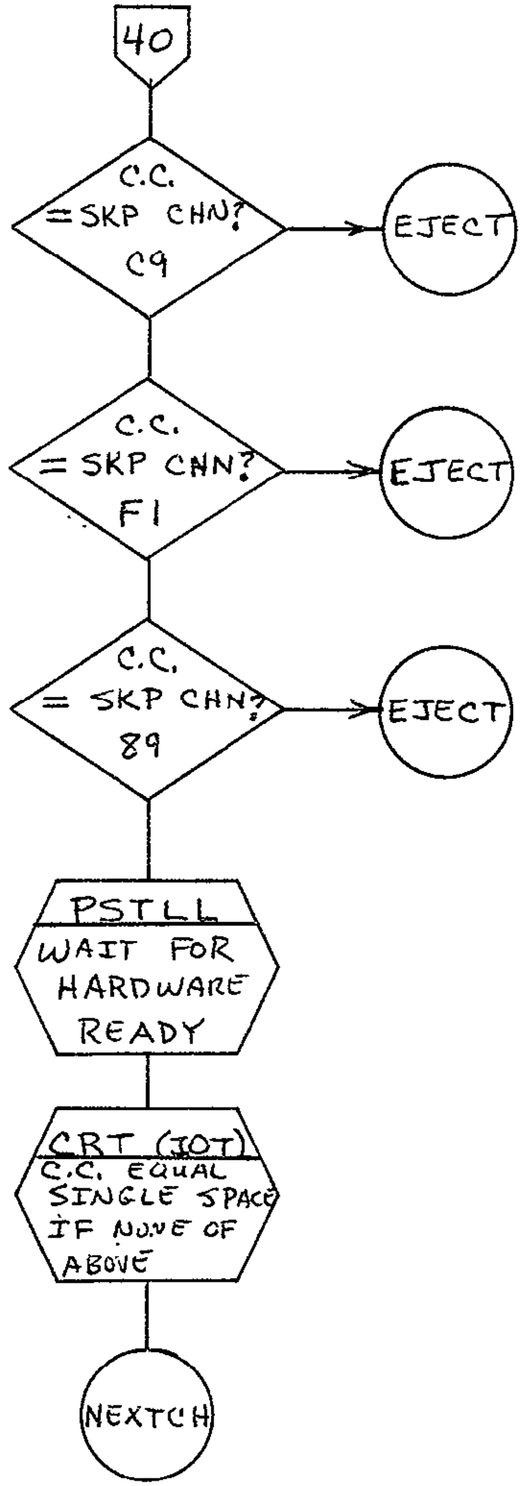

STRIP
SKP → STRIPF
SWITCH TO
INHIBIT 16mm
CUTMARKS
MDONEX
MVOVER
SETXYS
SET X & Y
DACS FOR
VECTOR
SETHDS
SET X1 Y1
FOR
DRWVEC
SETTLS
SET X2 Y2
FOR
DRWVEC
EXIT

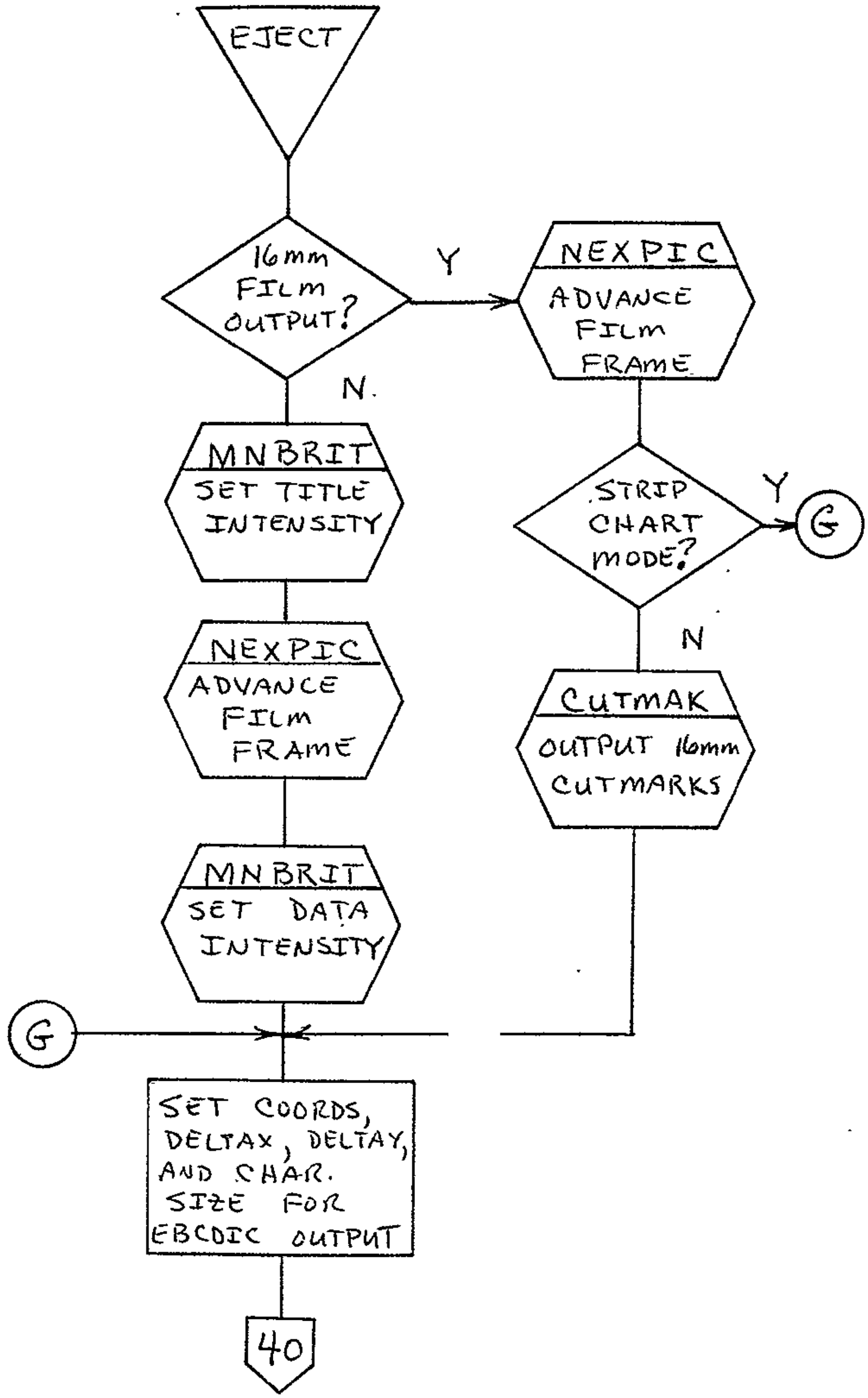

CUTMAK
ROTATE
CUTMARKS ALWAYS UPRIGHT
-2 → MARKS
OF FOUR VECTOR GROUPS PER CUTMARK
SET START COORDINATES X_1Y_1 & X_2Y_2 FOR CUTMARKS
MRKONE
-4 → STROKS
SET # OF VECTORS PER GROUP
STROX
MVOVER
SET X&Y DAC'S AND VECTOR POSITION
39

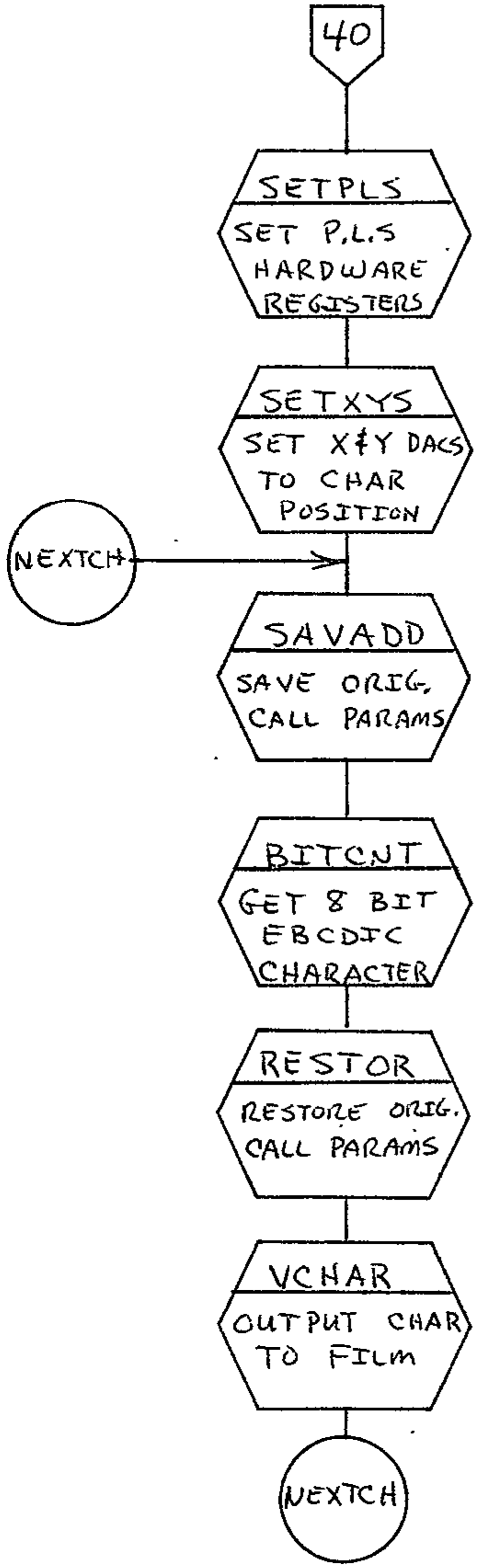

39
DRWVEC
OUTPUT VECTOR TO FILM
UPDATE X_1 & X_2 FOR NEXT VECTOR OUTPUT
STROKS=0 VECTOR GROUP DONE?
N
STROX
Y
UPDATE X COORDINATES FOR NEXT VECTOR GROUP
MARKS=0 COMPLETED CUTMARK?
N
MRKONE
Y
ROTATE
RESET TO PREVIOUS ROTATION
EXIT


SPACE3
SET COUNT FOR 3 LINE EJECTS
PSTLL
WAIT FOR HARDWARE READY
CRT (IOT)
CARR. RET.
DONE 3 LINES?
N
Y
NEXTCH


PROC76
SAVE CARRIAGE CONTROL CHARACTER
AC → SAVCHT
ROTATE
EBCDIC ID. FRAMES UPRIGHT
CARR. CNTR = SPACE 3 LINES?
60
Y
SPACE3
N
C.C. = SPACE 3 LINES?
19
Y
SPACE3
N
C.C. = SKP CHN?
F9
Y
EJECT
N
40


40
C.C. =SKP CHN? C9
EJECT
C.C. = SKP CHN? F1
EJECT
C.C. = SKP CHN? 89
EJECT
PSTLL
WAIT FOR HARDWARE READY
CRT (IOT)
C.C. EQUAL SINGLE SPACE IF NONE OF ABOVE
NEXTCH


EJECT
16mm FILM OUTPUT?
Y
N.
NEXPIC
ADVANCE FILM FRAME
MNBRIT
SET TITLE INTENSITY
STRIP CHART MODE?
Y
G
N
NEXPIC
ADVANCE FILM FRAME
CUTMAK
OUTPUT 16mm CUTMARKS
MNBRIT
SET DATA INTENSITY
G
SET COORDS, DELTAX, DELTAY, AND CHAR. SIZE FOR EBCDIC OUTPUT
40


40
SETPLS
SET P.L.S HARDWARE REGISTERS
SETXYS
SET X&Y DACS TO CHAR POSITION
NEXTCH
SAVADD
SAVE ORIG. CALL PARAMS
BITCNT
GET 8 BIT EBCDIC CHARACTER
RESTOR
RESTORE ORIG. CALL PARAMS
VCHAR
OUTPUT CHAR TO FILM
NEXTCH

2.2. COMA GRAY LEVEL, LANDSCAPE, AND CLASSIFICATION MAP PROCESSOR FOR 105 mm FICHE (CLAGRA)

2.2.1 Background

A. Author. W. T. Jackson, Aeronutronic Ford Corporation

B. Intent. CLAGRA processes 9-track magnetic tape formatted for earth resources microfiche imagery generation as delineated in PHO-TN598.

1. Gray-Level (GRAY) processes 9-track magnetic tapes formatted for variable length gray-level imagery with each eight-bit byte representing one picture element.

2. Landscape (LAND) processes 9-track magnetic tapes containing 48-bit DTE/LANDSCAPE gray-level and data words.

3. Classification (CLASS) processes 9-track magnetic tapes formatted for variable length character map images with each eight-bit byte representing one character.

C. Program History

1. Production Tape Date: 15 May 1975

2. Author. W. T. Jackson

3. Authorization. Task Agreement - P-2G03

4. Test Case. PHO-TN605

5. Revisions. Reference Appendix B, paragraph B.2

2.2.2 Introduction

2.2.2.1 Hardware Requirements

- FR80 with 12K memory
- 9-track magnetic tape unit
- 105 mm camera
- 16 mm adapter disk.

2.2.2.2 Software Requirements. The following files, found in I.I.I.'s SYM Directory, are required.

III109	III147	III162
III166	III163	III161
III164	III186	III166 INVAR
III164 FILM	III185	III166 ADVAN

2.2.2.3 Assembly Parameters. The assembly parameters in III109 shall be set for the proper machine configuration. Assembly parameters specific to the GRAY, LAND, and CLASS Processors are as follows.

A. BIGBUF. If 0, allows maximum amount of operator functions with minimum buffer space.

B. FONT. If 0, assembles standard III character font.

C. EBCDIC. If 1, assembles EBCDIC character set.

D. TAPELB. If 1, assembles code for processing of IBM standard tape labels.

E. TITLE. If 1, inserts routines for fiche title processing.

F. PTYPE. If 1, defines code for 105 mm microfiche title buffering.

G. 7TRACK. If 0, 7-track is not required; therefore, assembles 9-track magnetic tape handler.

H. TWOBUF. If 1, utilizes two magnetic tape buffers, CURBUF and NEXBUF, for higher throughput.

I. NASA. If 1, includes NASA specific character descriptors in character set.

J. LOCASE. If 1, lower case character set is required.

K. MANYUP. If 1, defines code for multiple images per frame for 105 mm microfiche.

L. FASTTY. If 1, assembles SYM code for teletype interrupt handler.

M. MUMBLE. If 1, defines system configuration output via teletype during assembly.

N. NEXPAG = NEXPIC. Equates NEXPAG to NEXPIC macro call.

2.2.2.4 Operator Commands. The following commands, entered by the operator via teletype, are available for use with the CLAGRA Program.

TIME

FRAME

GO

CONTINUE

TITLE

END JOB

MAKE FILM

CLEAR

ADVANCE

BACK

USE

REWIND

SKIP

TRY AGAIN

STANDARD LABEL

UNLABELED

PITCH/MARGIN = 69, 52

SIZE OF TITLE = 14500, 10500

IMAGES PER FICHE = 6, 7

HITS-CHARS, VEC, PTS, TITLE, CMARK = 1,1,1,1,1

FOCUS

ROTATION = 0

2.2.3 Analysis

2.2.3.1 Major Control Section

A. Description. Upon issuance of a GO command by the operator via the console teletype, the III routine PSTART transfers control to the GRACLA processing routine BEGIN. BEGIN initializes all switches; does initial camera advancing and positioning using the FC7CLR, FRSPIC, and NEXPIC subroutines; initializes the magnetic tape handler via MTRINI; and transfers control to BITCNT.

BITCNT accesses data from magnetic tape buffers via MTBYTE. For each new logical record (i.e., new data frame) control is transferred to CCNTRL for decoding and routing of COM control functions via TITREC, GRAYL, CLASSM, LANDS and DESCTL. Image size (character/line and lines/frame) as delineated in COM control records G, K, L, and D, is set via HEXOCT, and control is transferred to SETPT.

SETPT sets the frame position on film for GRAY, CLASS, and LAND, both data and overlay, via calls to SETGRA, SETCLS, and SETLND, respectively. When a control word other than GRAY, CLASS, or LAND has been accessed, SETPT transfers control to CTLERR.

Upon completion of frame positioning, control is transferred to GRADTA, DESDTA, CLSDTA, or LANDTA for GRAY, DESCRIPTIOR, CLASS, and LAND data processing, respectively. Control remains within the aforementioned routines until completion of image generation for the given film frame, at which time control is transferred to OVLDTA. OVLDTA processes the remaining data within the logical tape record as DTE overlay data. Upon completion of overlay data processing, control is returned to BITCNT for next logical record.

Upon completion of each microfiche for GRAY and LAND, an eight-level density calibration wedge is output as the last frame.

When an EOF is accessed, control is returned to the operator for either job termination or continuation from a continuation tape.

B. Input/Output

1. Input. Data input via 9-track magnetic tape consists of COM control words; GRAY, CLASS and LAND data words; and DTE overlay data words. All input data tapes are recorded in variable spanned length record format (blocked or unblocked). Detailed descriptions of the format(s)/data content of the magnetic data tapes are delineated in PHO-TN598.

2. Output. Data is output to 105 mm microfiche. Each microfiche will be output in a 7-row by 6-column format. Row one shall contain titling, with each remaining row containing six unique GRAY, CLASS, or LAND images.

C. Linkages

1. External

Routine	Program
FC7CLR	III166
FRSPIC	III166
NEXPIC	III166
MTRINI	III163
KYBLIS	III166
GETT	III163
SETXYS	III162
SETHD	III162
SETTL	III162
DRWVEC	III162
PSTLL	III166
SETPLS	III166
VCHAR	III147
MTBYTE	III163
FICTAP	III186
MONTOR	III166
FCFIN	III166

2. Internal Routines

GET8BT	NEWSEG	HUNDRD	DTEVEC
SETPT	CCNTRL	TENS	GT8MK4
GRADTA	SAVADD	ONES	CALXS
CLSDTA	CKKERR	OVLDTA	CALYS
LANDTA	RESTOR	CHRBRN	DTESPT
CTLERR	TITREC	PNTOUT	DTETYP
GETCOM	GRAYL	CHROUT	LETCHR
DESDTA	CLASSM	GETCHR	LTEVEC
SETGRA	LANDS	CRTGET	LCALXS
SETCLS	DESCTL	CONVRT	LCALYS
BITCNT	GRACTL	NEWLOG	LTESPT
GETSEG	MVCOM	CKVEC	LBARS
GETBLK	THOUSN	CKSPT	BARS

2.2.3.2 Subroutines

A. BARCH. Routine used to output character overlay for GRAY and LAND density wedge. Table CHXY contains X coordinate, Y coordinate, and character code for the overlay data.

B. BARS. Called once per fiche, in the GRAY mode, for output of an eight-level density calibration wedge plus overlay. Wedge dimensions are 1000 scan lines by 1000 pixels, with the first 500 scans containing shades 0 thru 7 at 125 pixels per shade, and the last 500 scans containing shades 7 thru 0. Vector and character overlay are output via a call to BARVC. Exits to calling routine via BARVC. Calling sequence: JMS BARS

C. BARVC. Routine used to set appropriate counters and table addresses for output of vector and character overlay via calls to BARVE and BARCH, respectively. Exits to calling routine via BARS or LBARS based on GRAYSW. Calling sequence: JMP BARVC

D. BARVE. Routine used to output vector overlay for GRAY and LAND density wedge. Table VCXY contains X_1Y_1 and X_2Y_2 vector coordinates for the overlay. Vector output is via DRWVEC. Calling sequence: JMS BARVE

E. BITCNT. Entered with the AC containing the number of bits to be accessed. Uses MTBYTE to get bits requested, returning to the calling routine with the bits requested in the AC. Calling sequence:

LAC N ($1 \leq N \leq 18$)
JMS BITCNT

F. CALXS. Entered with AC containing X coordinate in DTE units. Converts DTE to FR80 units (conversion factor in VDELX), adds frame offset (XOFFOV) and returns to calling routine with FR80 X coordinate in the AC. Calling sequence with AC containing DTE X coordinates: JMS CALXS

G. CALYS. Accesses 10-bit DTE Y coordinate via BITCNT, converts to FR80 units (conversion factor in VDELY), adds frame offset (YOFFOV) and returns to calling routine with FR80 Y coordinate in the AC. Calling sequence: JMS CALYS

H. CCNTRL. Accesses eight-bit character code via GET8BT and checks for COM control indicator (D9). If not a COM control, exits to CKKERR. When COM control, checks next byte for control function and branch to proper handler. Calling sequence: JMS CCNTRL

I. CHROUT. Entered with the AC containing a character to be output. Converts character to EBCDIC via CONVRT, outputs character via VCHAR, returns control to calling routine. Calling sequence, where N = 8-bit DTE character:

LAC N
CHROUT

J. CKKERR. When in GRAY or CLASS mode, exits to CTLERR. When in LAND mode, resets LNPERF and CHPERL, advances to next frame via NEXPIC, resets frame position via SETPT, and exits to LANDTA. Calling sequence: JMP CKKERR

K. CLASSM. Sets processing mode switches for CLASS MAP data; sets character deltas (CLDELY = -62, CLDELX = 46); and transfers control to GRACTL. Calling sequence: JMP CLASSM

L. CLSDTA. Entered with AC containing first eight-bit character. When in overlay mode, transfers control to OVLDTA. When in CLASS mode, sets hardware registers via SETPLS; sets X and Y start coordinates via SETXYS; and outputs characters via calls to CHROUT and CETCHR. At end of line, positions to next line via CLTGET. At end of frame, sets processing mode to overlay and transfers control to GETCOM. Calling sequence: JMP CLSDTA

M. CLTGET. Executes PSTLL for hardware ready, updates DAC's via SETXYS for next line, checks for operator interrupt via KYBLIS, transfers control to CNEWLN (entry point in CLSDTA) for next line of character output. Calling sequence: JMP CLTGET

N. CETCHR. Accesses next eight-bit character via GET8BT and transfers control to CLRGEN (entry point in CLSDTA), with character for output in the AC. Calling sequence: JMP CETCHR

O. CONVRT. Entered with DTE character in AC. Character is converted to EBCDIC via DTETAB table. Exit is to calling routine with converted character in AC. Calling sequence where N = DTE character:

```
LAC N
JMS CONVRT
```

P. CTLERR. Transfers control to MONOUX with address of control error message in the AC. Calling sequence: JMP CTLERR

Q. DESCTL. Sets processing mode switches for descriptor data, sets DTE to FR80 conversion factors (VDELX, VDELY), and sets PRSWT equal to NOP to ignore DTE overlay data until access of a start print word. Calling sequence: JMP DESCTL

R. DESDTA. Transfers control to OVLDTA, when there is overlay data. Otherwise, sets CHDELX, CHDELY and CHRSIZ for description data. Transfers control to CNITCH for CLASS, INITCH for GRAY, or LNITCH for LAND. (Entry points are in CLSDTA, GRADTA, and LANDTA, respectively.) Calling sequence: JMP DESDTA

S. DTESPT. Decodes DTE start print word as accessed via BITCNT. Converts DTE X and Y coordinates to FR80 units via CALXS and CALYS calls, respectively; sets PLS registers via SETPLS; and outputs character by call to CHROUT. Transfers control to GETCOM. Calling sequence: JMP DTESPT

T. DTETYP. Transfers control to IGNDTE when PRSWT signifies no start print word processing for this frame. Otherwise, processes DTE special characters NULL, CR, and MR; if there are none, outputs as print character via CHROUT until CNTR (character counter equal to 5) is exhausted. Exits to GETCOM.

U. DTEVEC. Decodes and converts DTE 48-bit vector word to FR80 X_1Y_1 and X_2Y_2 vector coordinates. Outputs vector via call to III routine DRWVEC. Exits to GETCOM. Calling sequence: JMP DTEVEC

V. GETBLK. Accesses 32 bits of data from magnetic tape via MTBYTE. Used to read record block and mask off block descriptor word (BDW). Exits to calling routine. Calling sequence: JMS GETBLK

W. GETSEG. Gets logical record segment from tape input area. Determines segment control code, segment length, and carriage control from segment descriptor word (SDW). If segment length is two or less, control is returned to GETSEG+1 for next logical record segment. If segment control code is 0 or 1, which specifies COM control record, CCNTRL is called for processing of the COM control record. Upon return from CCNTRL, control is transferred to calling routine. Calling sequence: JMS GETSEG

X. GET8BT. Used to access eight-bit data byte from magnetic tape buffer via BITCNT. Returns to calling routine with AC containing right-justified eight-bit byte. Calling sequence: JMS GET8BT

Y. GRACTL. Sets processing mode switches for GRAY data processing. Transfers control to HEXOCT. Calling sequence: JMP GRACTL

Z. GRADTA. Entered with AC containing first eight-bit character. When in overlay mode, transfers control to OVLDTA. When in GRAY, sets hardware registers via SETPLS, sets X and Y start coordinates via SETXYS, outputs characters via calls to CHROUT and CHRBRN, and outputs pixels via PNTOUT. At end of line, positions to next line via CRTGET. At end of frame, sets processing mode to overlay and transfers control to GETCOM. Calling sequence: JMP GRADTA

AA. GRAYL. Sets processing mode switches for GRAY data, sets character deltas (CLDELX = 10, CLDELY = -10), and transfers control to GRACTL. Calling sequence: JMP GRAYL

BB. GT8MK4. Accesses eight-bit data byte from magnetic tape buffer via BITCNT. Masks low-order four bits of AC and returns to calling routine. Calling sequence: JMS GT8MK4

CC. HEXOCT. Utilized for decode and conversion of lines per frame (LNPERF) and characters per line (CHPERL) from G or K control record. Defaults to 439 by 612 respectively for LAND mode. Advances film via NEXPIC, sets start coordinates by call to SETPT, and transfers control to GETSG1. If LNPERF equals zero, sets CCTRSW for COM control processing. Calling sequence: JMP HEXOCT

DD. HUNDRD. Converts EBCDIC hundreds position character to decimal. Returns to calling routine with hundreds value in AC. Calling sequence: JMS HUNDRD

EE. LANDS. Sets processing mode switches for LAND data, sets character deltas (CLDELX = 10, CLDELY = 10), and transfers control to GRACTL. Calling sequence: JMP LANDS

FF. LANDTA. Entered with AC containing first eight-bit character. When in overlay mode, transfers control to OVLDTA. When in LAND, sets hardware registers via SETPLS, sets X and Y start coordinates via SETXYS, outputs characters via calls to CHROUT and LHRBRN, and outputs pixels via PNTOUT. At end of frame, sets processing mode to overlay and transfers control to GETCOM. Calling sequence: JMP LANDTA

GG. LBARS. Called once per fiche, in the LAND mode, for output of an eight-level density calibration wedge plus overlay. Wedge dimensions are 1000 scan lines by 1000 pixels, with the first 500 scans containing shades 0 through 7 at 125 pixels per shade and the last 500 scans containing shades 7 through 0. Vector and character overlay are output via a call to BARVC. Exits to calling routine via BARVC. Calling sequence: JMS LBARS

HH. LCALXS. Entered with AC containing X coordinate in RTCC 1024 units. Converts to DTE 612 units and computes corresponding FR80 raster address. Returns control to calling routine with X coordinate, in FR80 units, in the AC. Calling sequence with RTCC X coordinates:

JMS LCALXS
in AC

II. LCALYS. Accesses 10-bit Y coordinate in RTCC units, converts to DTE 439 units, and computes corresponding FR80 raster address. Returns control to calling routine with Y coordinate in FR80 units in the AC. Calling sequence: JMS LCALYS

JJ. LMYSET. Updates Y DAC for next line of LAND density wedge and resets X and Y DAC's via SETXYS. Calling sequence: JMS LMYSET

KK. LTESPT. Decodes LAND DTE start printword as accessed via BITCNT. Sets CHRSIZ, CHDELX and CHDELY from XSIZ table using DTE character size code as index. Converts DTE X and Y coordinates to FR80 units via LCALXS and LCALYS calls, respectively, sets PLS registers via SETPLX, outputs character by call to CHROUT, sets PRSWT for typewriter word processing, and transfers control to GETCOM. Calling sequence: JMP LTESPT

LL. <u>LTEVEC</u>. Decodes and converts DTE 48-bit vector word to FR80 X_1Y_1 and X_2Y_2 vector coordinates. Outputs vector via DRWVEC and transfers control to GETCOM. Calling sequence: JMP LTEVEC

MM. <u>MVCOM</u>. Transfers COM control data, as specified in the T record, into buffer TITARE for 105 mm. Data is accessed from tape buffer one byte per access via GET8BT. Calling sequence with AC containing first titling character: JMS MVCOM

NN. <u>MYSET</u>. Updates Y DAC for next line of GRAY density wedge and resets X and Y DAC's via SETXYS. Calling sequence: JMS MYSET

OO. <u>NEWSEG</u>. Reads in new logical segment; gets bits requested from old and new segment and returns to calling routine with data in AC. Calling sequence: JMP NEWSEG

PP. <u>OVLDTA</u>. Checks overlay data for legitimate DTE data words. Transfers control to CKVEC for vector words to CKSPT for start print words, to DTETYP for typewriter words, and to IGNDTE to "bit bucket" non-DTE data words. Calling sequence with AC containing DTE data word bits 1-18: JMP OVLDTA

QQ. <u>PNTOUT</u>. Utilized for output of GRAY and LAND pixel data. Entered with AC containing left-justified pixel intensity. Calling sequence, where n = three-bit intensity:

```
LAC n
JMS PNTOUT
```

RR. <u>RESTOR</u>. Restores BITCNT and GETSEG parameters to condition previous to COM control loop. Calling sequence: RESTOR

SS. <u>SAVADD</u>. Saves BITCNT and GETSEG return addresses prior to COM control loop. Calling sequence: SAVADD

TT. <u>SETPT</u>. Controls setting of overlay and data frame start coordinates for GRAY, CLASS, and LAND. Calling sequence: JMS SETPT

UU. <u>TENS</u>. Converts EBCDIC tens position character to decimal. Returns to calling routine with tens value in the AC. Calling sequence: JMS TENS

VV. <u>THOUSN</u>. Converts EBCDIC thousands position character to decimal. Returns to calling routine with thousands value in the AC. Calling sequence: JMS THOUSN

WW. <u>TITREC</u>. Moves title data into TITARE via MVCOM, calls FICTAP for title processing, sets TITSW for no film advance, and transfers control to GETSG1. Calling sequence: JMP TITREC

2.2.3.3 <u>Constants and Variables</u>

A. <u>Internal</u>

1. <u>BITNSW</u>. Temporary save location of number of bits requested by GET macro, in SAVADD and RESTOR routines.

2. <u>BITNUM</u>. Contains number of bits requested by GET macro.

3. <u>BITSVAD</u>. Temporary save location of return address from GET call.

4. <u>CCTRSW</u>. Switch used to initiate COM control record processing.

5. <u>CHPERL</u>. Counter for character-per-line variable.

6. <u>CLASSW</u>. Switch utilized in routing flow of program for classification map processing.

7. <u>CLDELX</u>. Character delta X for CLASS data.

8. CLDELY. Character delta Y for CLASS data.

9. CNTR. Counter containing number of characters per DTE typewriter word.

10. DESCSW. Switch used for designating descriptor data processing.

11. DSDELX. Character delta X for descriptor data.

12. DSDELY. Character delta Y for descriptor data.

13. DTETAB. Table containing DTE character codes, two characters per word.

14. GETSGAD. Temporary save location of GETSEG routine return address.

15. GRAYSW. Switch used for delineating GRAY image processing.

16. LANDSW. Switch used for delineating LANDSCAPE image processing.

17. LNPERF. Counter for lines per frame variable.

18. MBITNM. Variable containing number of bits requested by GET macro in BITCNT routine.

19. MBITSV. Temporary save location of number of bits requested. Referenced in SAVADD and RESTOR.

20. NEWSGB. Variable containing n bits ($1 \leq n \leq 18$) of data from next record segment.

21. NEWSGC. Variable containing number of bits required from next record segment to satisfy GET macro.

22. OLDSGB. Variable containing n bits ($1 \leq n \leq 18$) of data remaining in current record segment.

23. OLDSGC. Variable containing number of bits remaining in current record segment.

24. OVERSW. Switch used to initiate and/or inhibit overlay data processing.

25. PRSWT. Switch used to designate DTE start print word has been processed for current frame, thereby allowing processing of typewriter words.

26. SEGCNT. Counter containing number of bits in current record segment.

27. SEGSW. Switch used to reset BITCNT return address upon completion of COM control processing.

28. XHD. Contains starting X coordinate of DTE vector as accessed from DTE Vector word.

29. XOFFDT. Variable used for designation of starting X or left margin of GRAY, CLASS, and/or LAND image area in FR80 raster units.

30. XOFFOV. Variable used for designation of starting X or left margin of GRAY, CLASS, and/or LAND overlay area in FR80 raster units.

31. XTL. Contains end X coordinate of DTE vector as accessed from DTE Vector word.

32. YHD. Vector Y_1 coordinate.

33. YOFFDT. Variable used for designation of starting Y or top margin of GRAY, CLASS, and/or LAND image area in FR80 raster units.

34. YOFFOV. Variable used for designation of starting Y or top margin of GRAY, CLASS, and/or LAND overlay area in FR80 raster units.

35. YTL. Vector Y_2 coordinate.

B. External

1. CHDELX. Word location reserved for FR80 character delta X.

2. CHDELY. Word location reserved for FR80 character delta Y.

3. CHRSIZ. Word location reserved for FR80 character size.

4. CURBUF. Cell used for current magnetic tape buffer address (one of two magnetic tape buffers).

5. FCXCNT. Constant delineating number of columns per fiche.

6. FCYCNT. Constant delineating number of rows per fiche

7. FICTB. Address of fiche title buffer area, as decoded by III186.

8. NEXBUF. Cell used for next magnetic tape buffer address (one of two magnetic tape buffers).

9. OPRCON. Contains NOP op code.

10. PLSON. Switch used to control make film option.

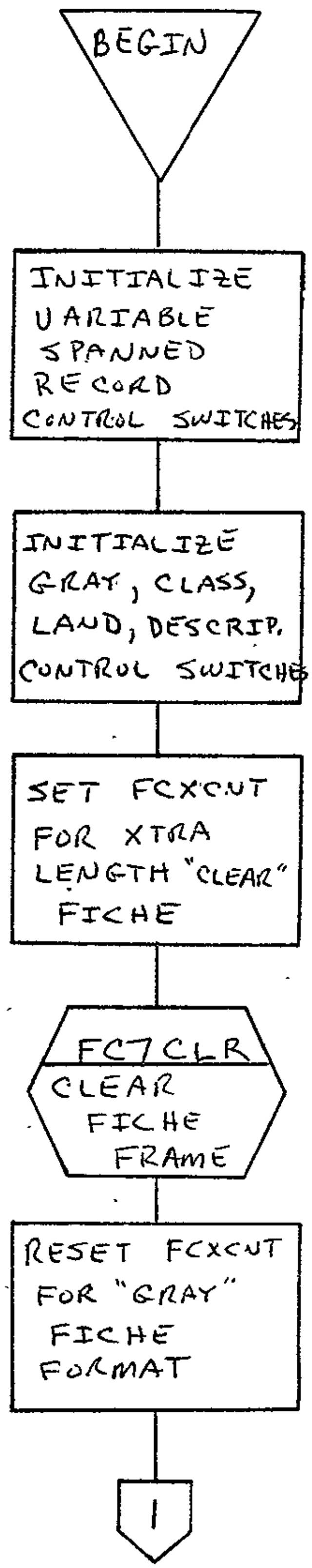
11. RECSPT. Cell containing FR80 spot size being used in film generation.

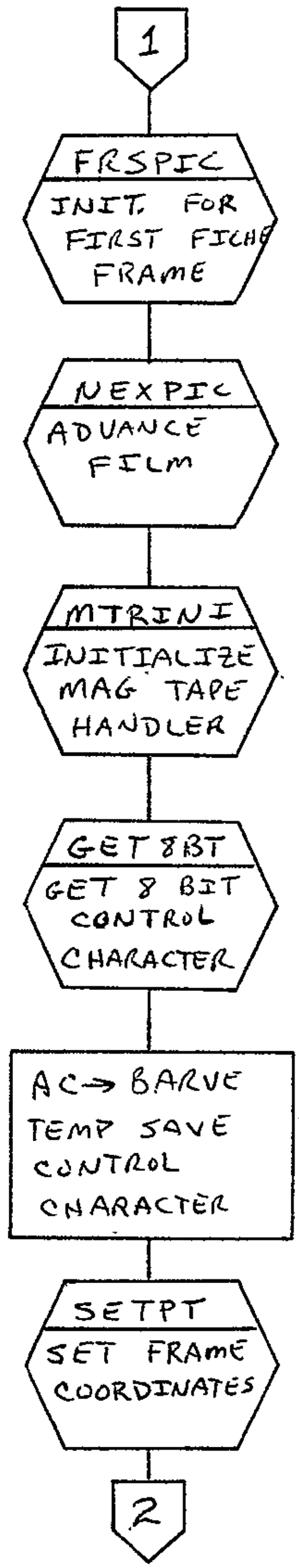
12. SKPCON. Contains SKP op code.

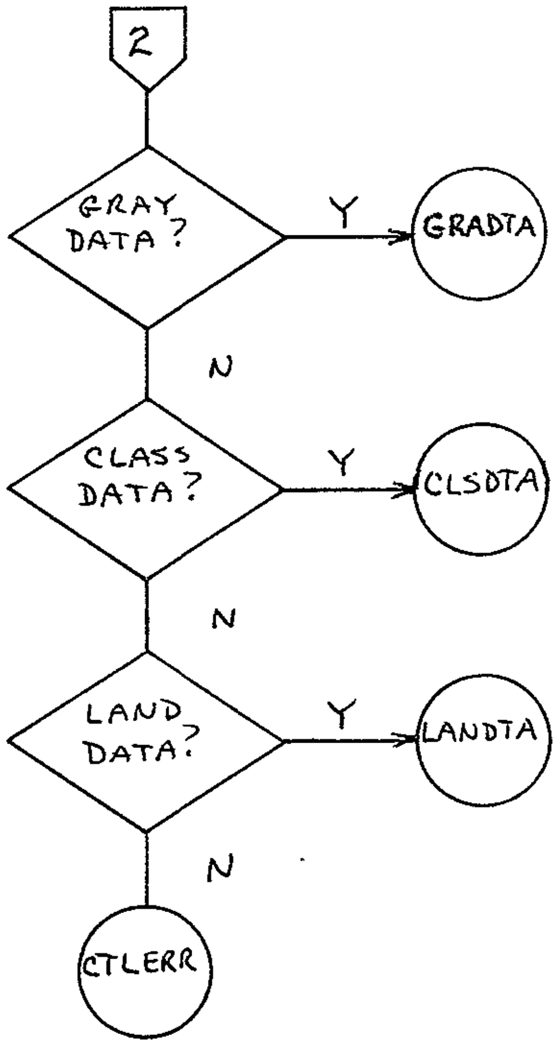
13. TITARE. Interim fiche title record buffer.

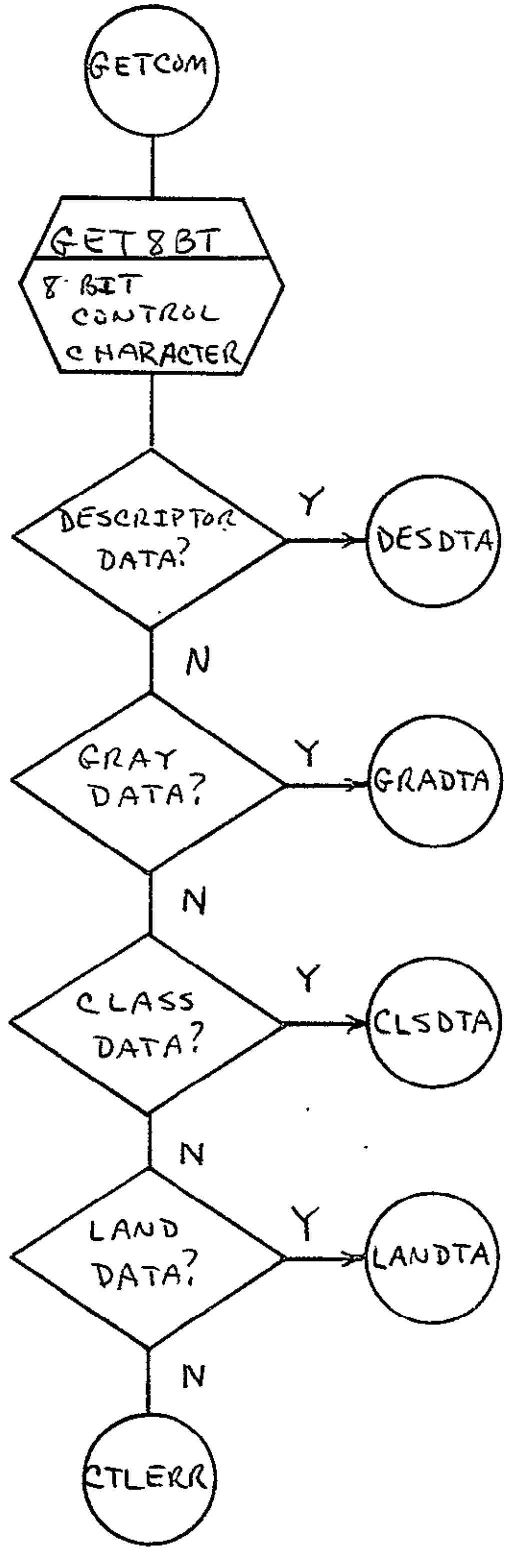
14. TPOINT. Contains address of next available word in FICTB.

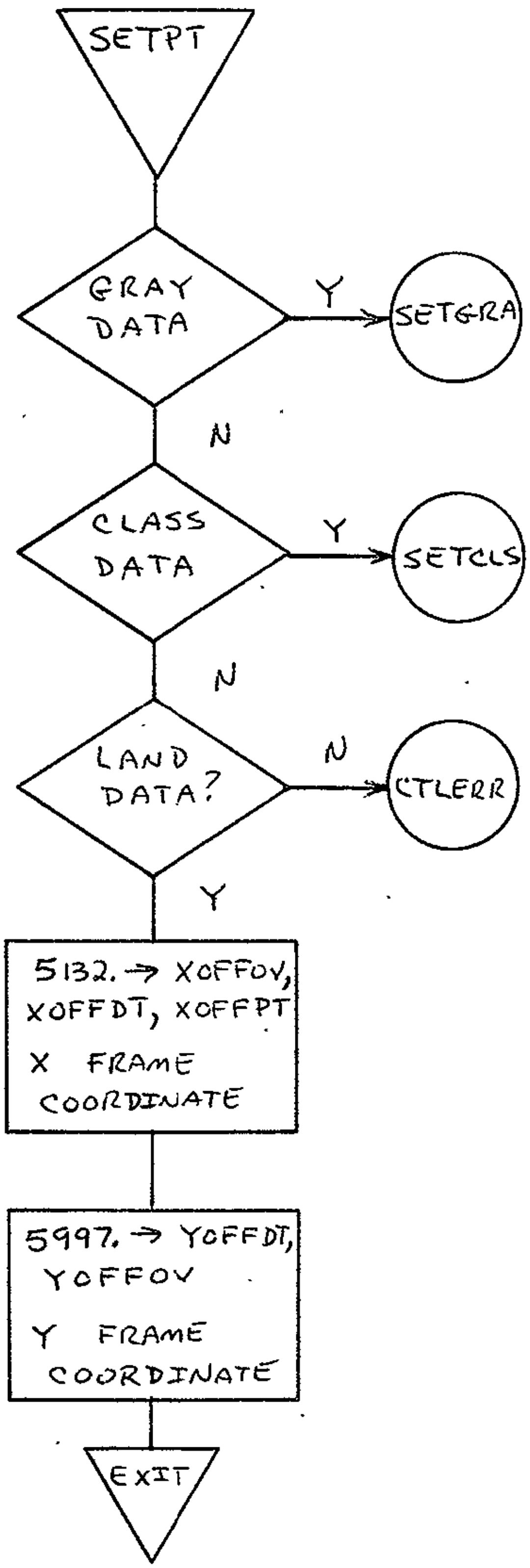
2.2.3.4 Flow Charts. See following pages.

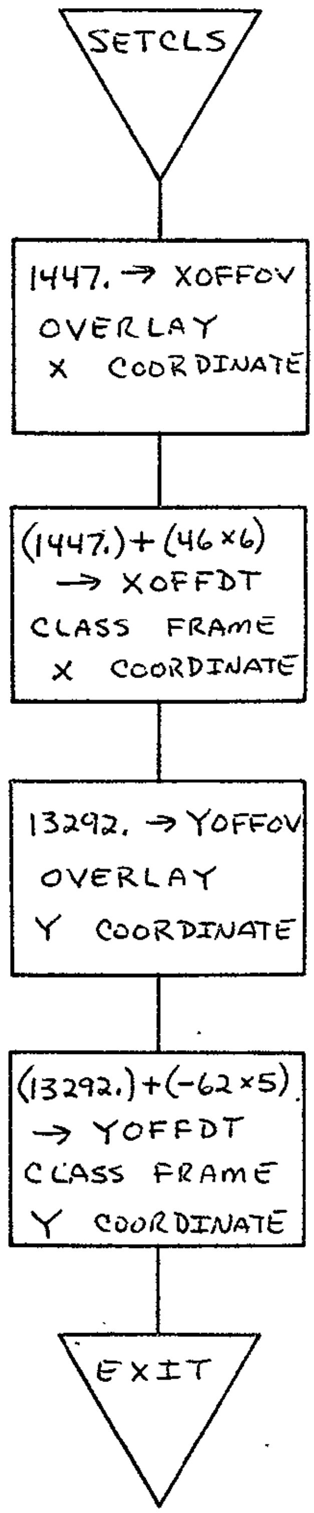

BEGIN
INITIALIZE VARIABLE SPANNED RECORD CONTROL SWITCHES
INITIALIZE GRAY, CLASS, LAND, DESCRIP. CONTROL SWITCHES
SET FCXCNT FOR XTRA LENGTH "CLEAR" FICHE
FC7CLR
CLEAR FICHE FRAME
RESET FCXCNT FOR "GRAY" FICHE FORMAT
1

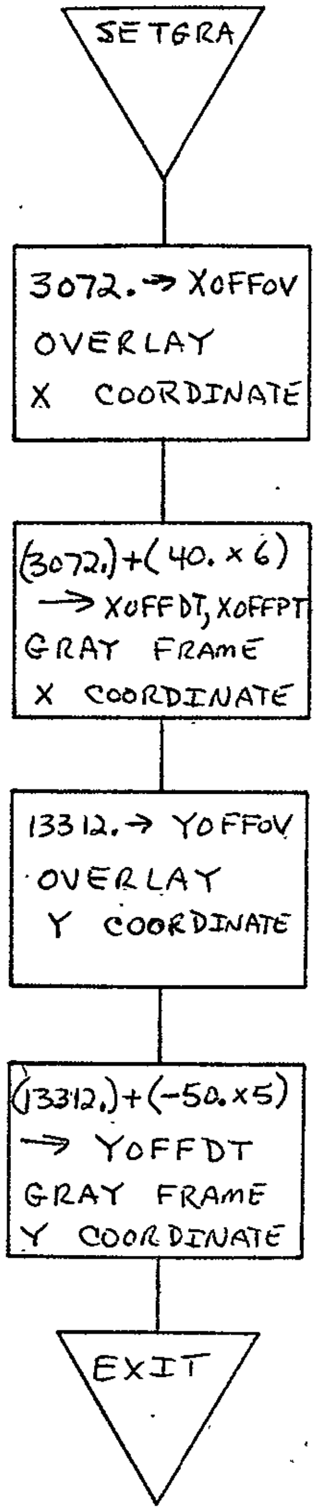

1
FRSPIC
INIT. FOR FIRST FICHE FRAME
NEXPIC
ADVANCE FILM
MTRINI
INITIALIZE MAG TAPE HANDLER
GET8BT
GET 8 BIT CONTROL CHARACTER
AC→BARVE
TEMP SAVE CONTROL CHARACTER
SETPT
SET FRAME COORDINATES
2

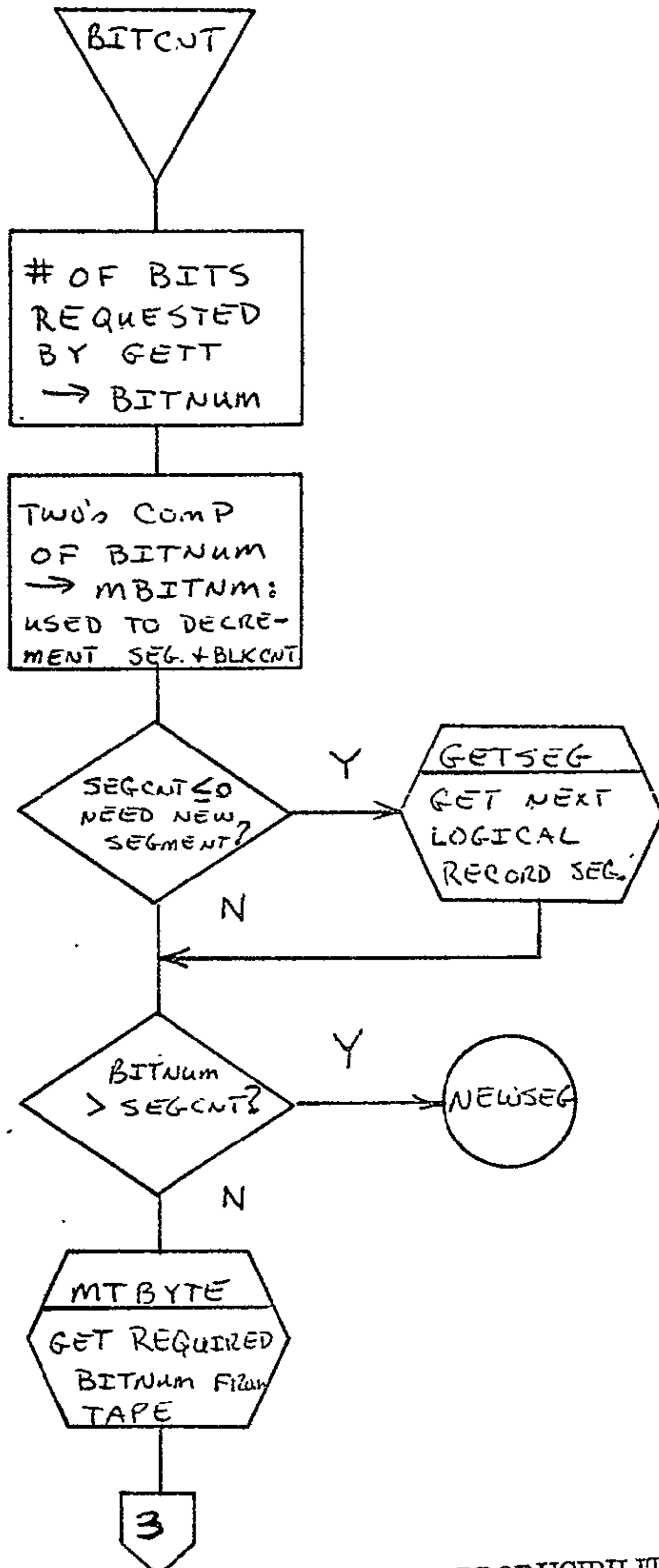

2
GRAY DATA?
Y
GRADTA
N
CLASS DATA?
Y
CLSDTA
N
LAND DATA?
Y
LANDTA
N
CTLERR


GETCOM
GET8BT
8 BIT CONTROL CHARACTER
DESCRIPTOR DATA?
Y
DESDTA
N
GRAY DATA?
Y
GRADTA
N
CLASS DATA?
Y
CLSDTA
N
LAND DATA?
Y
LANDTA
N
CTLERR

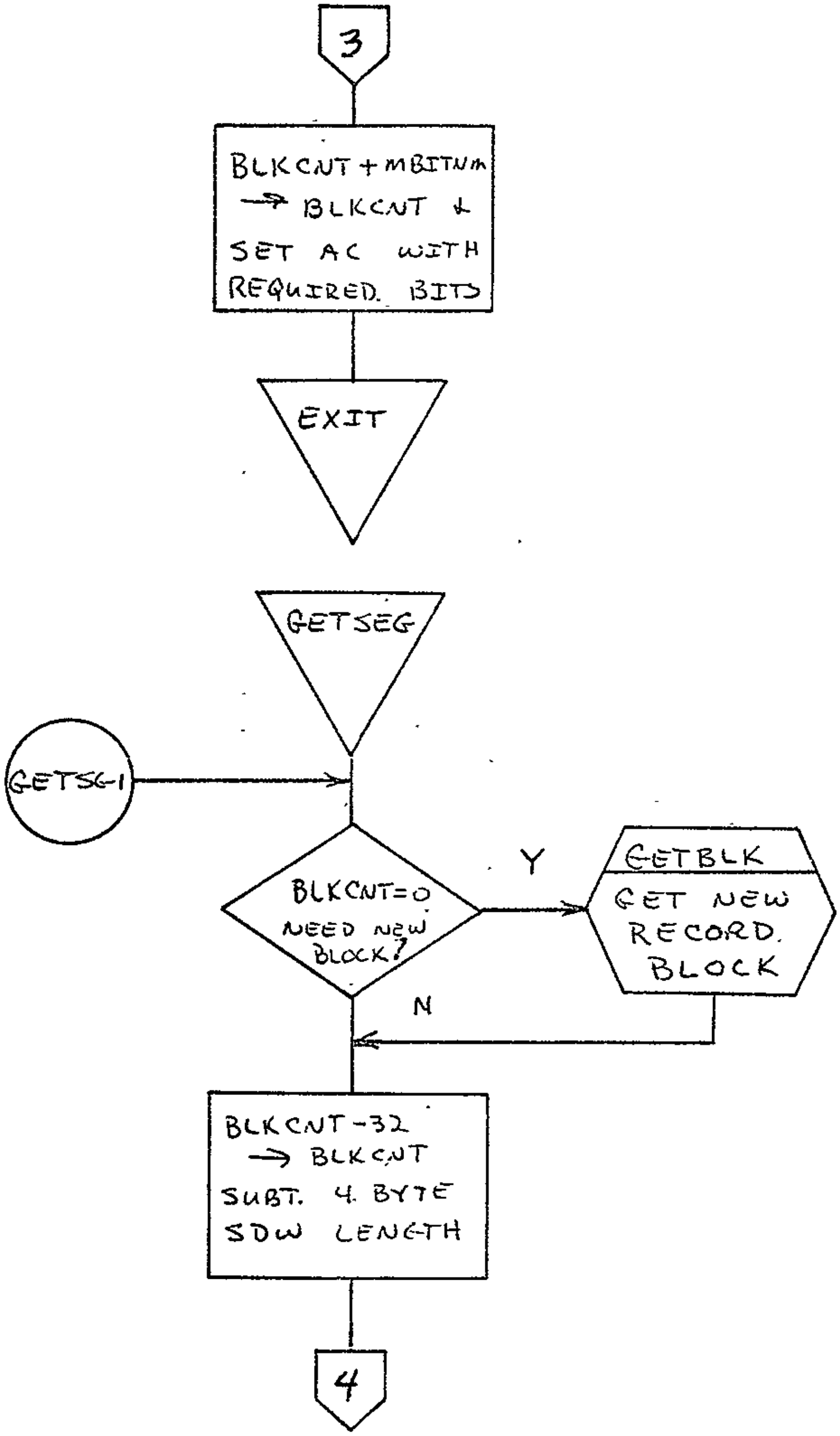

SETPT
GRAY DATA
Y
SETGRA
N
CLASS DATA
Y
SETCLS
N
LAND DATA?
N
CTLERR
Y
5132. → XOFFOV, XOFFDT, XOFFPT
X FRAME COORDINATE
5997. → YOFFDT, YOFFOV
Y FRAME COORDINATE
EXIT

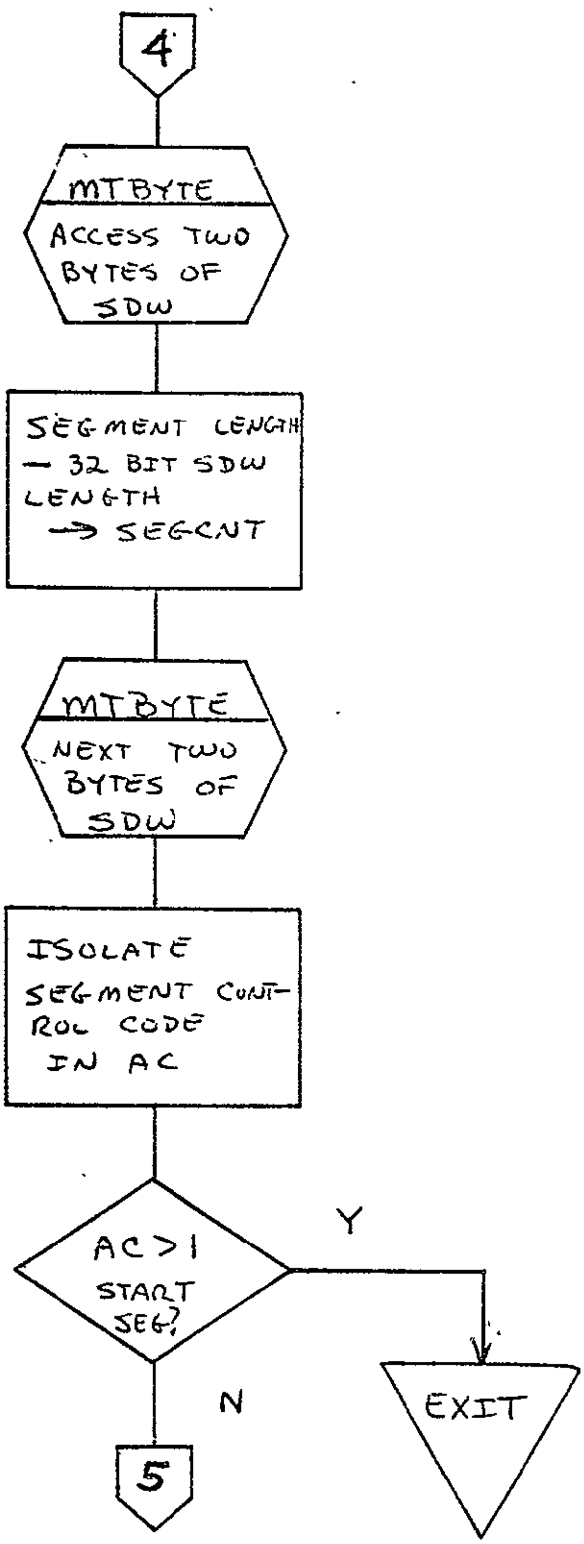

SETCLS
1447. → XOFFOV
OVERLAY
X COORDINATE
(1447.)+(46×6)
→ XOFFDT
CLASS FRAME
X COORDINATE
13292. → YOFFOV
OVERLAY
Y COORDINATE
(13292.)+(-62×5)
→ YOFFDT
CLASS FRAME
Y COORDINATE
EXIT

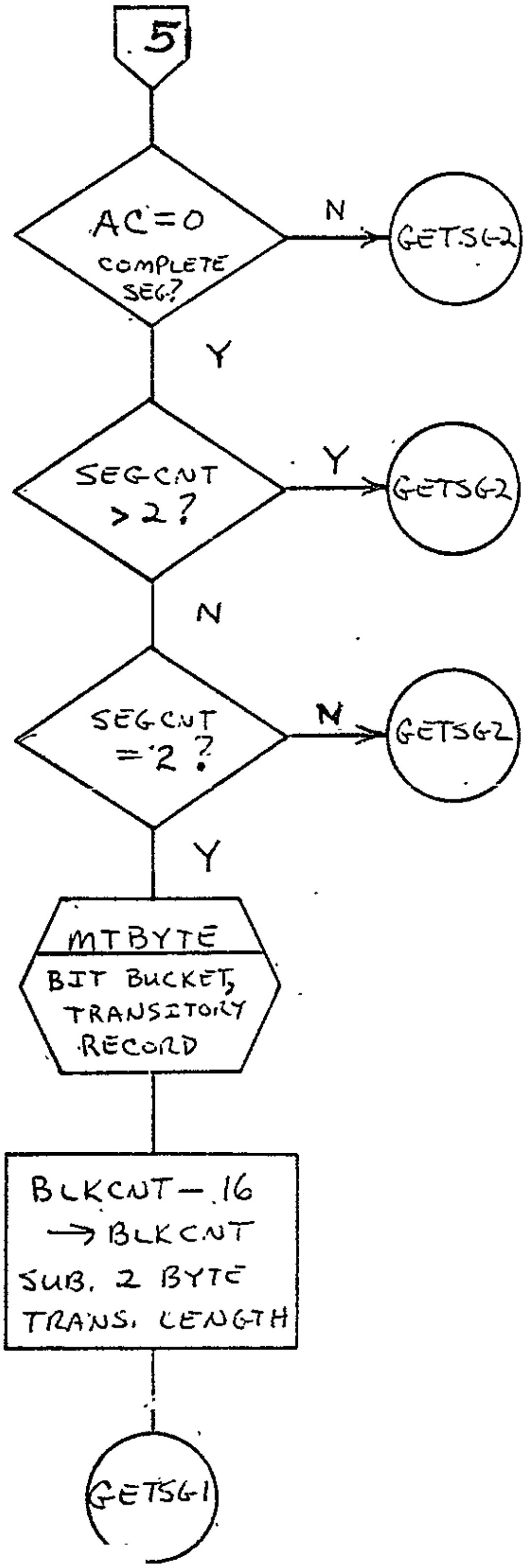

SETGRA
3072. → XOFFOV
OVERLAY
X COORDINATE
(3072.)+(40. x 6)
→ XOFFDT, XOFFPT
GRAY FRAME
X COORDINATE
13312. → YOFFOV
OVERLAY
Y COORDINATE
(13312.)+(-50.x5)
→ YOFFDT
GRAY FRAME
Y COORDINATE
EXIT

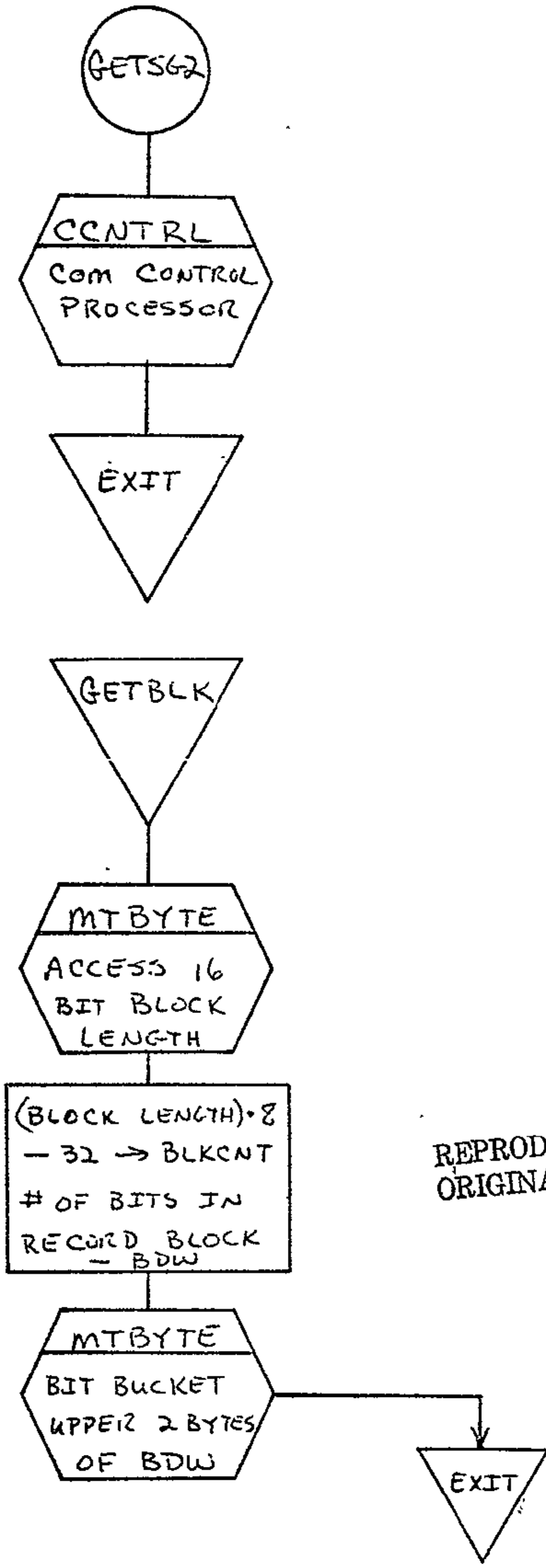


REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

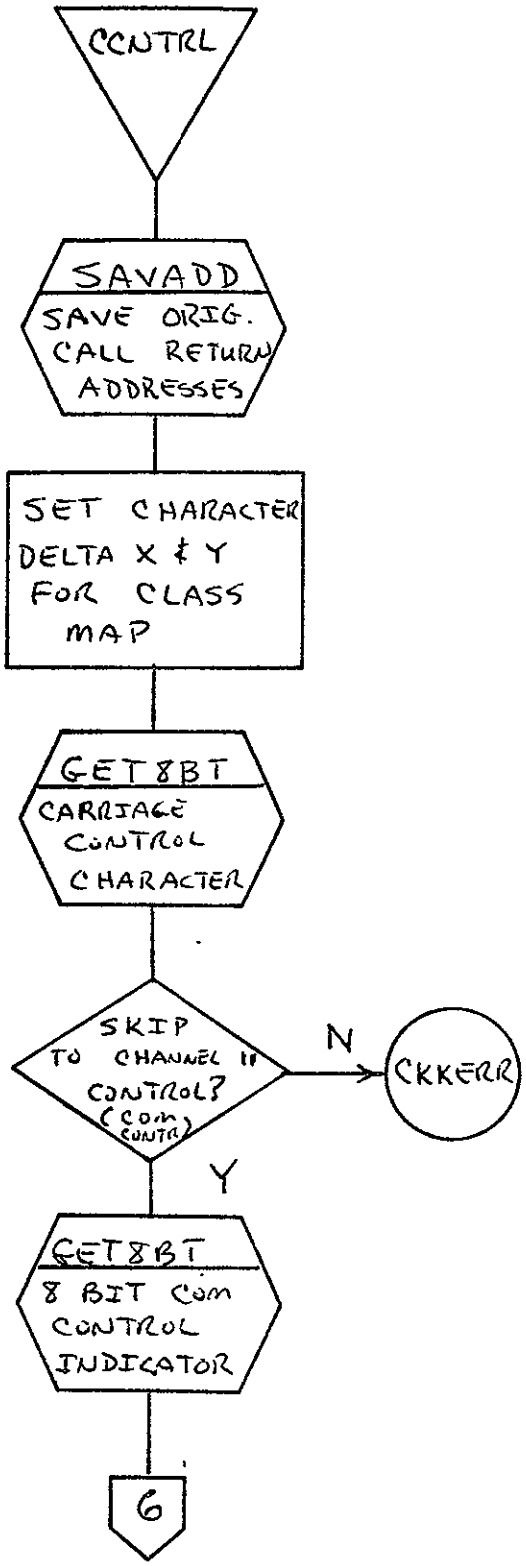

3
BLKCNT + MBITNM → BLKCNT & SET AC WITH REQUIRED BITS
EXIT
GETSEG
GETSG1
BLKCNT=0 NEED NEW BLOCK?
Y
N
GETBLK
GET NEW RECORD BLOCK
BLKCNT-32 → BLKCNT SUBT. 4 BYTE SDW LENGTH
4

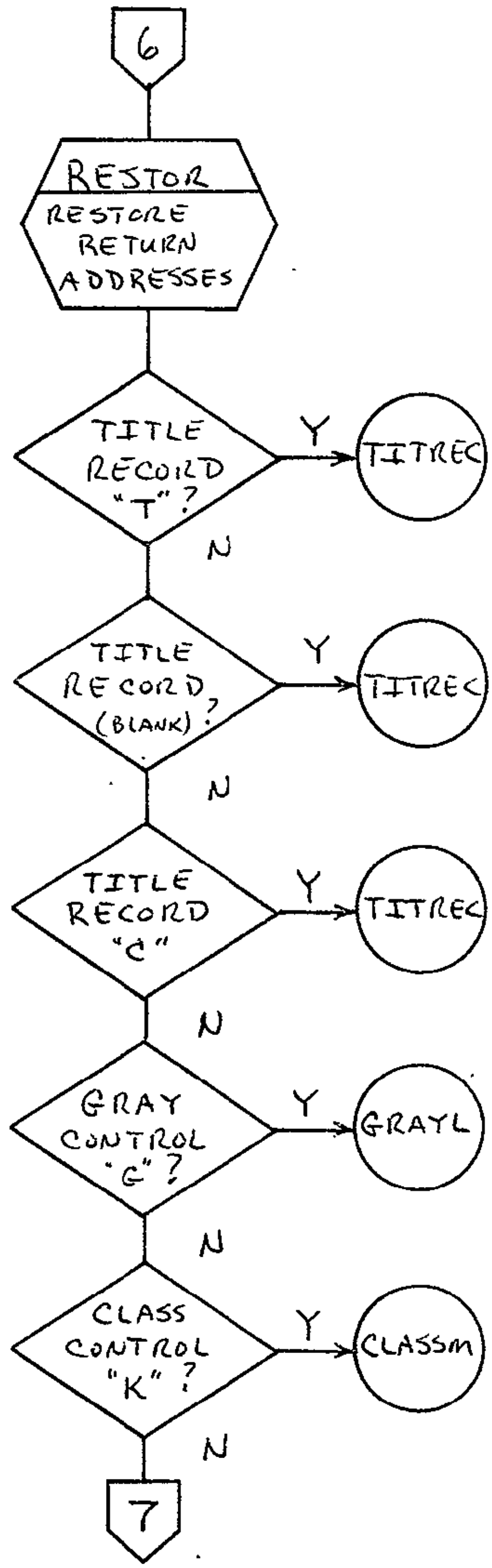

4
MTBYTE
ACCESS TWO BYTES OF SDW
SEGMENT LENGTH — 32 BIT SDW LENGTH → SEGCNT
MTBYTE
NEXT TWO BYTES OF SDW
ISOLATE SEGMENT CONTROL CODE IN AC
AC>1 START SEG?
Y
N
EXIT
5

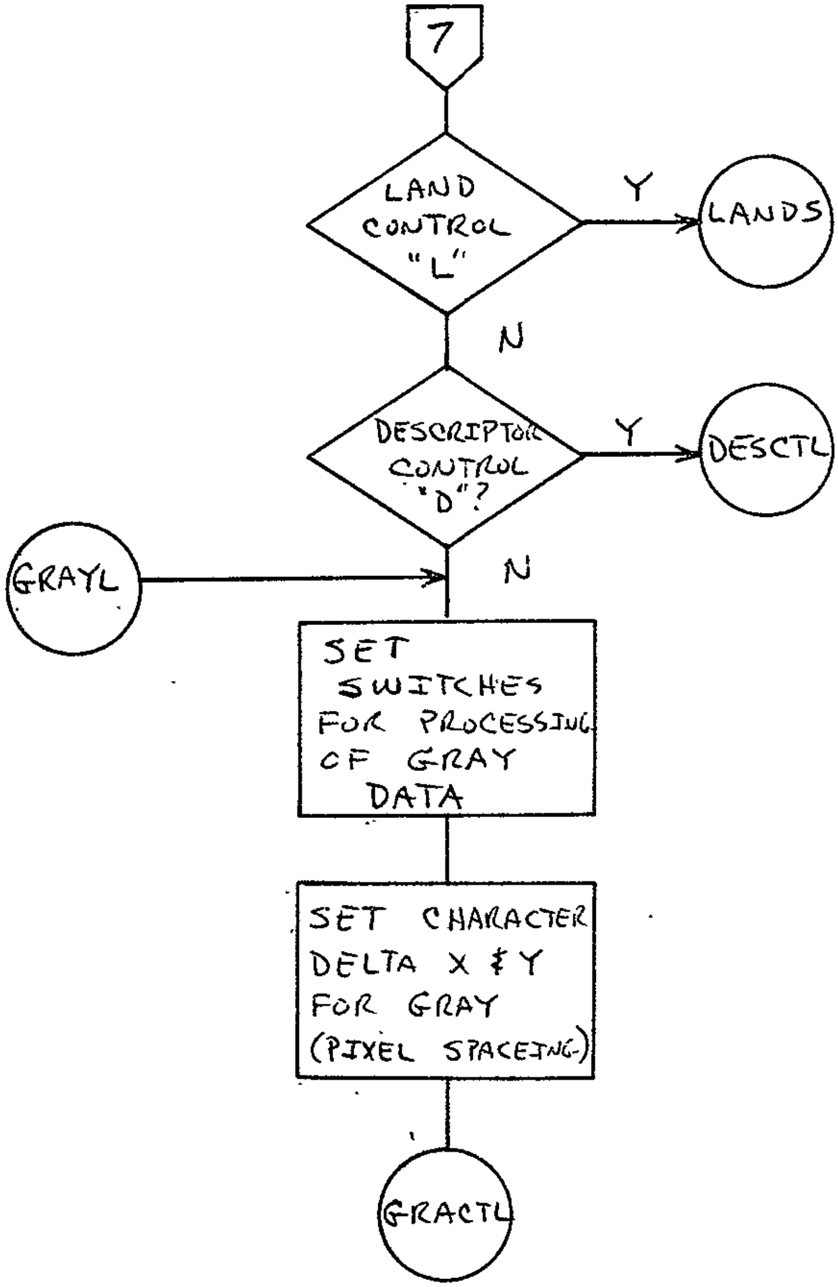

5
AC=0
COMPLETE SEG?
N
GETSG2
Y
SEGCNT >2?
Y
GETSG2
N
SEGCNT =2?
N
GETSG2
Y
MTBYTE
BIT BUCKET, TRANSITORY RECORD
BLKCNT-16 → BLKCNT
SUB. 2 BYTE TRANS. LENGTH
GETSG1

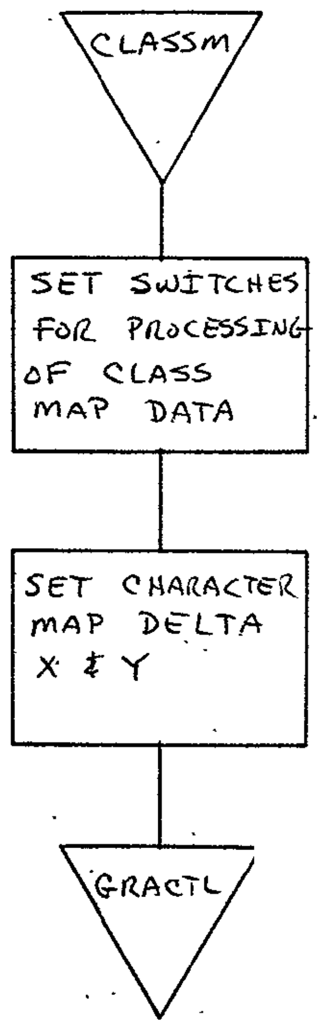


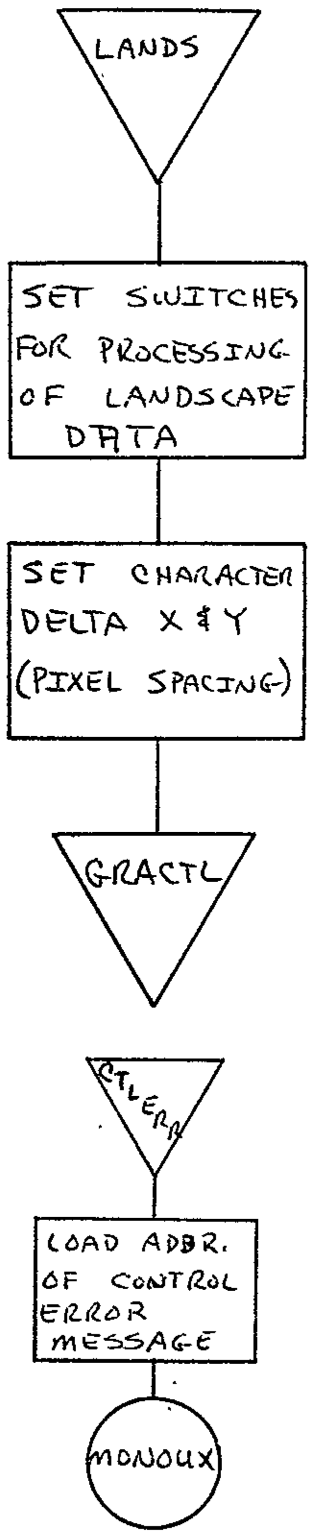
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

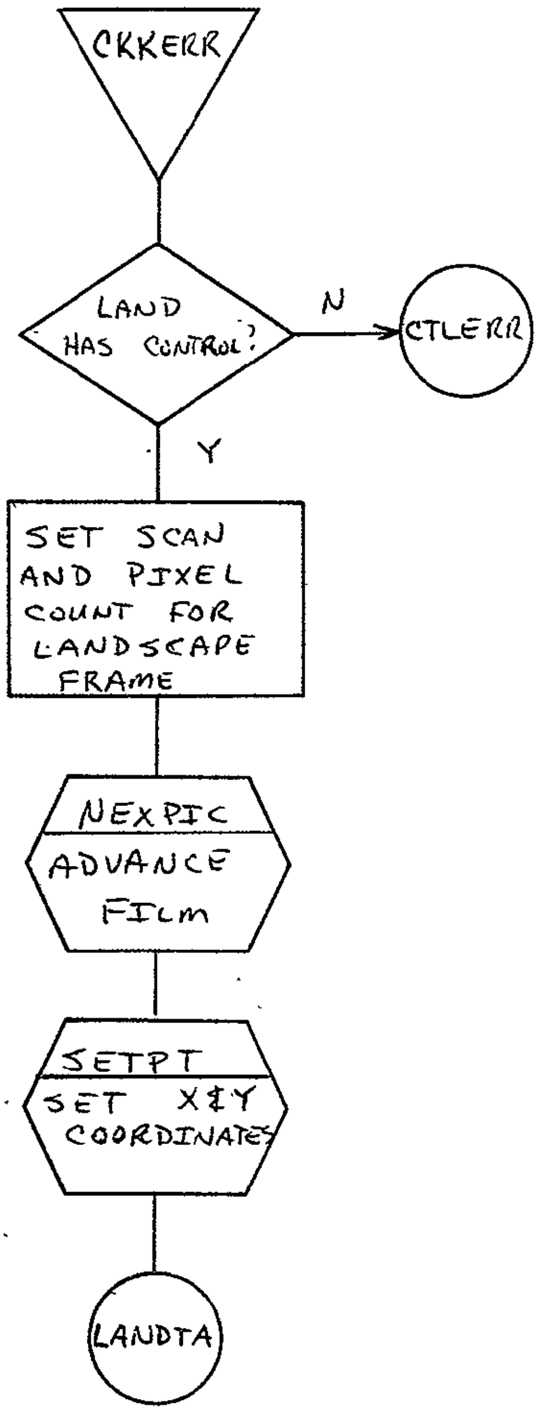

CCNTRL
SAVADD
SAVE ORIG. CALL RETURN ADDRESSES
SET CHARACTER DELTA X & Y FOR CLASS MAP
GET8BT
CARRIAGE CONTROL CHARACTER
SKIP TO CHANNEL 11 CONTROL? (COM CONTR)
N
CKKERR
Y
GET8BT
8 BIT COM CONTROL INDICATOR
6

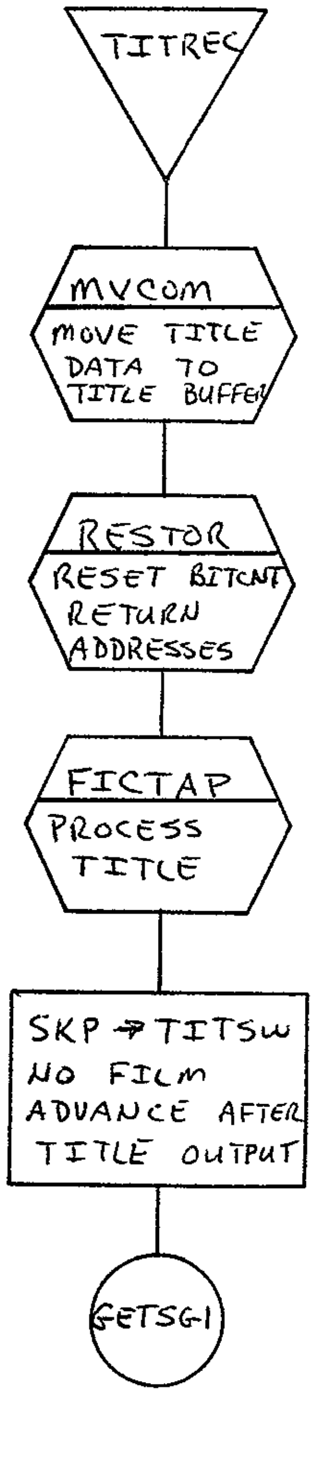

6
RESTOR
RESTORE RETURN ADDRESSES
TITLE RECORD "T"?
Y
TITREC
N
TITLE RECORD (BLANK)?
Y
TITREC
N
TITLE RECORD "C"
Y
TITREC
N
GRAY CONTROL "G"?
Y
GRAYL
N
CLASS CONTROL "K"?
Y
CLASSM
N
7

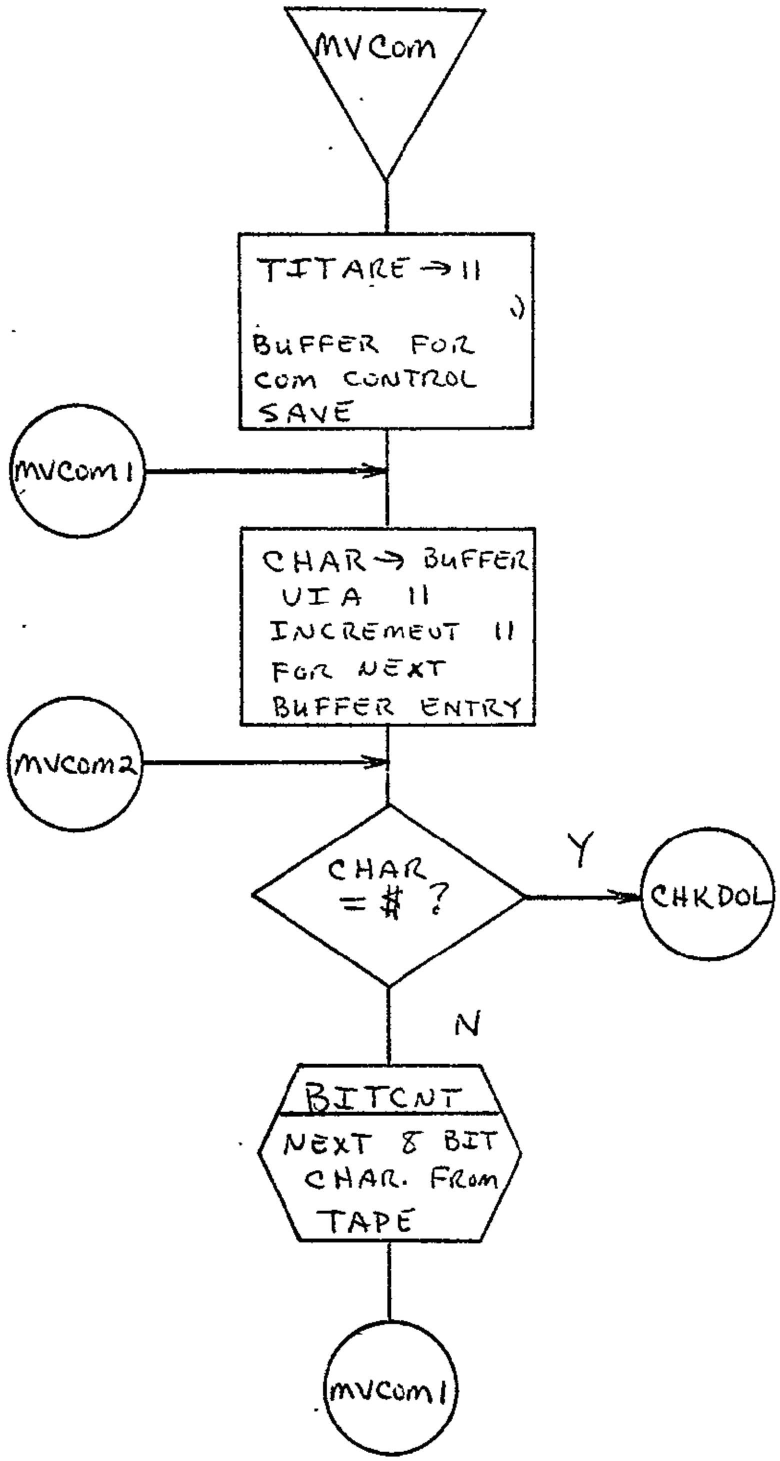

7
LAND CONTROL "L"
Y
LANDS
N
DESCRIPTOR CONTROL "D"?
Y
DESCTL
GRAYL
N
SET SWITCHES FOR PROCESSING OF GRAY DATA
SET CHARACTER DELTA X & Y FOR GRAY (PIXEL SPACEING)
GRACTL

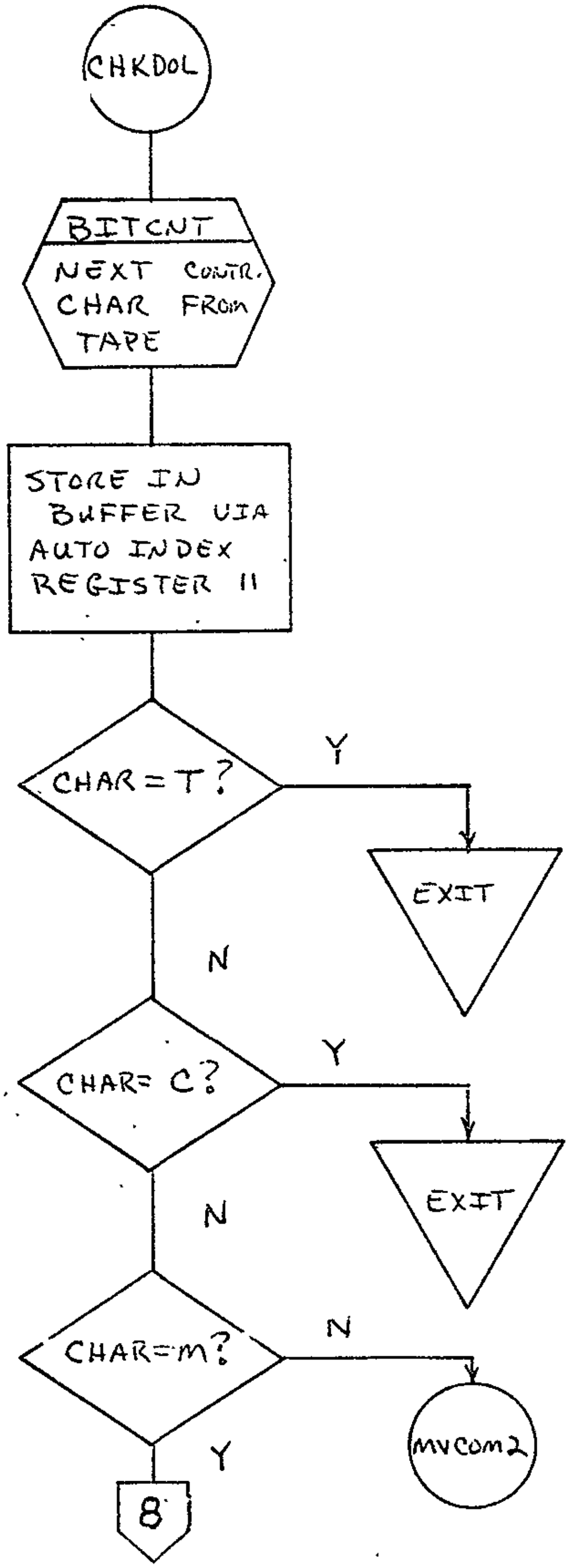

CLASSM
SET SWITCHES FOR PROCESSING OF CLASS MAP DATA
SET CHARACTER MAP DELTA X & Y
GRACTL

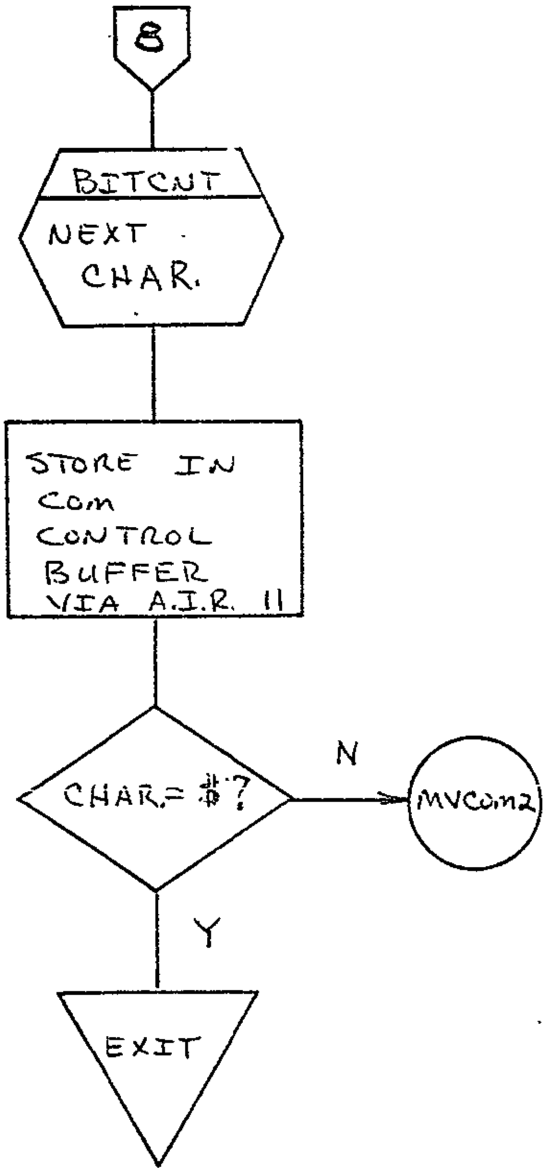

LANDS
SET SWITCHES FOR PROCESSING OF LANDSCAPE DATA
SET CHARACTER DELTA X & Y (PIXEL SPACING)
GRACTL
CTLERR
LOAD ADDR. OF CONTROL ERROR MESSAGE
MONOUX

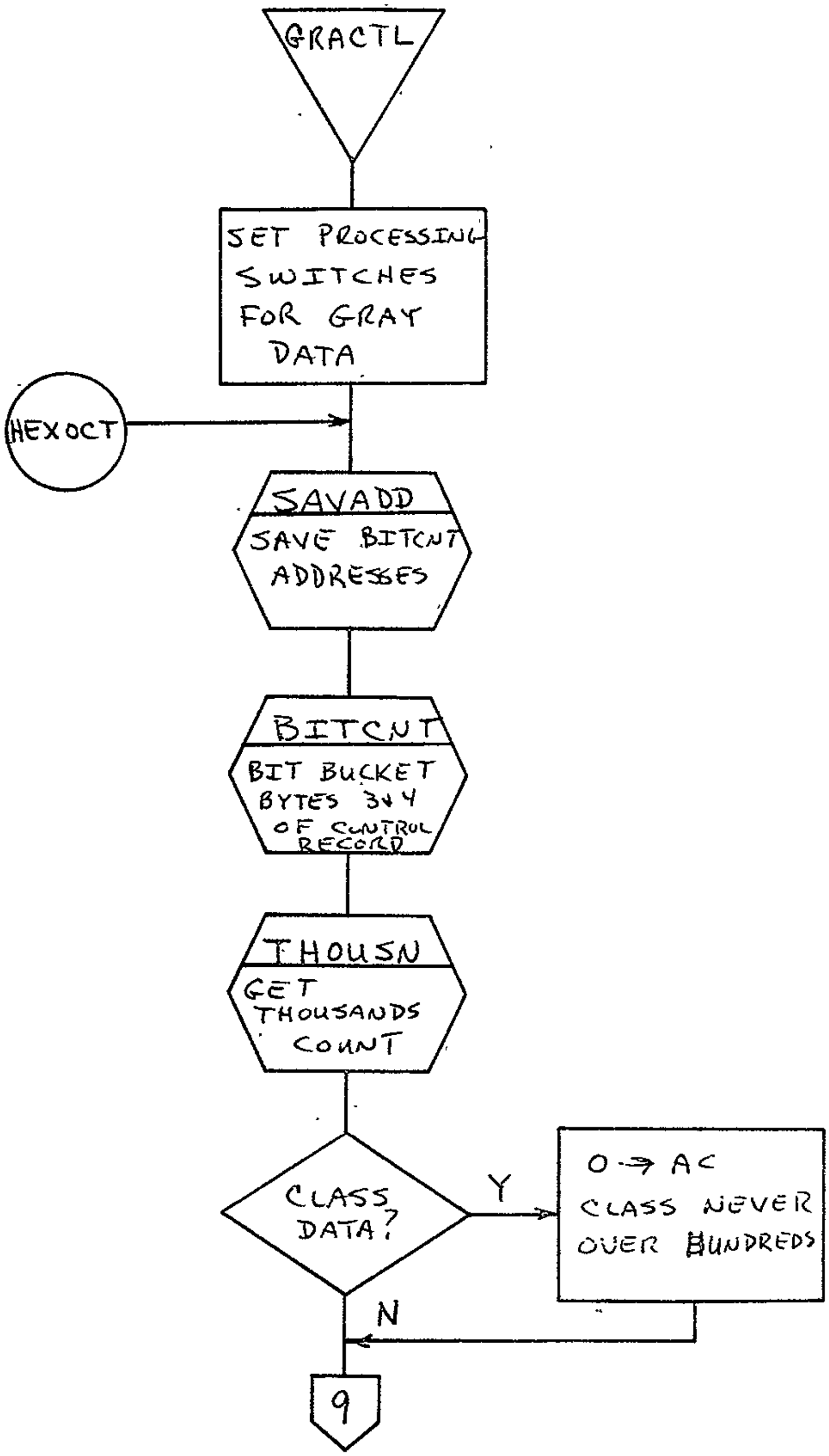

CKKERR
LAND HAS CONTROL?
N
CTLERR
Y
SET SCAN AND PIXEL COUNT FOR LANDSCAPE FRAME
NEXPIC
ADVANCE FILM
SETPT
SET X&Y COORDINATES
LANDTA

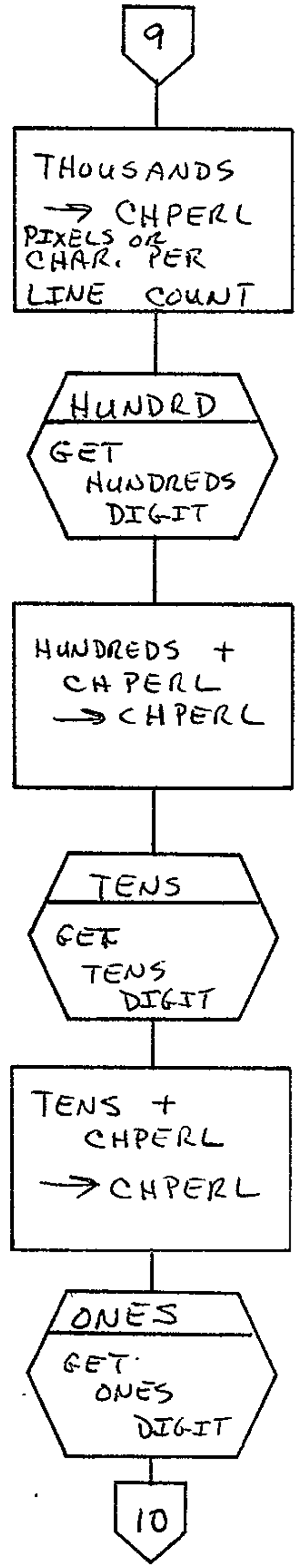

TITREC
MVCOM
MOVE TITLE DATA TO TITLE BUFFER
RESTOR
RESET BITCNT RETURN ADDRESSES
FICTAP
PROCESS TITLE
SKP → TITSW
NO FILM ADVANCE AFTER TITLE OUTPUT
GETSG1

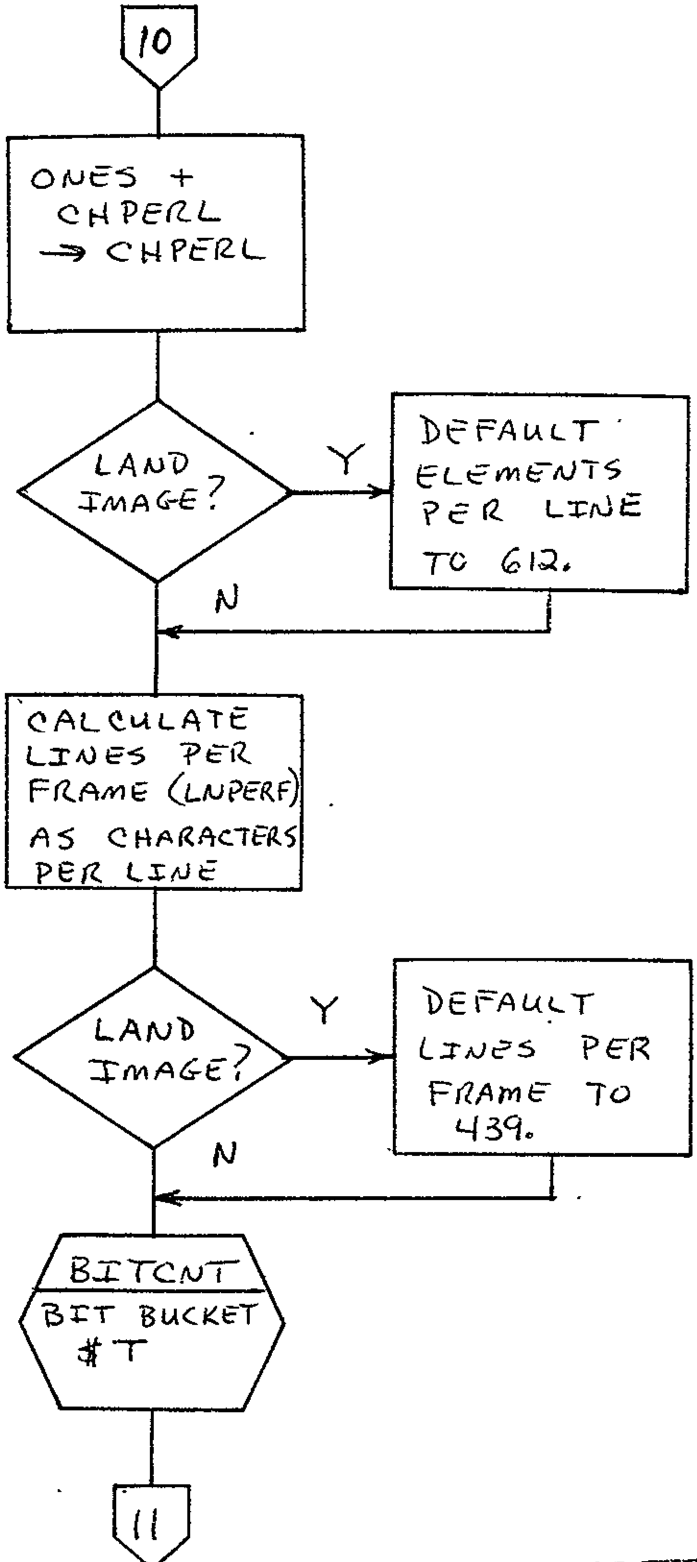

MVCom
TITARE → I1
BUFFER FOR
COM CONTROL
SAVE
mvcom1
CHAR → BUFFER
VIA I1
INCREMENT I1
FOR NEXT
BUFFER ENTRY
mvcom2
CHAR
= # ?
Y
CHKDOL
N
BITCNT
NEXT 8 BIT
CHAR. FROM
TAPE
mvcom1


CHKDOL
BITCNT
NEXT CONTR. CHAR FROM TAPE
STORE IN BUFFER VIA AUTO INDEX REGISTER 11
CHAR = T?
Y
EXIT
N
CHAR= C?
Y
EXIT
N
CHAR=M?
N
MVCOM2
Y
8

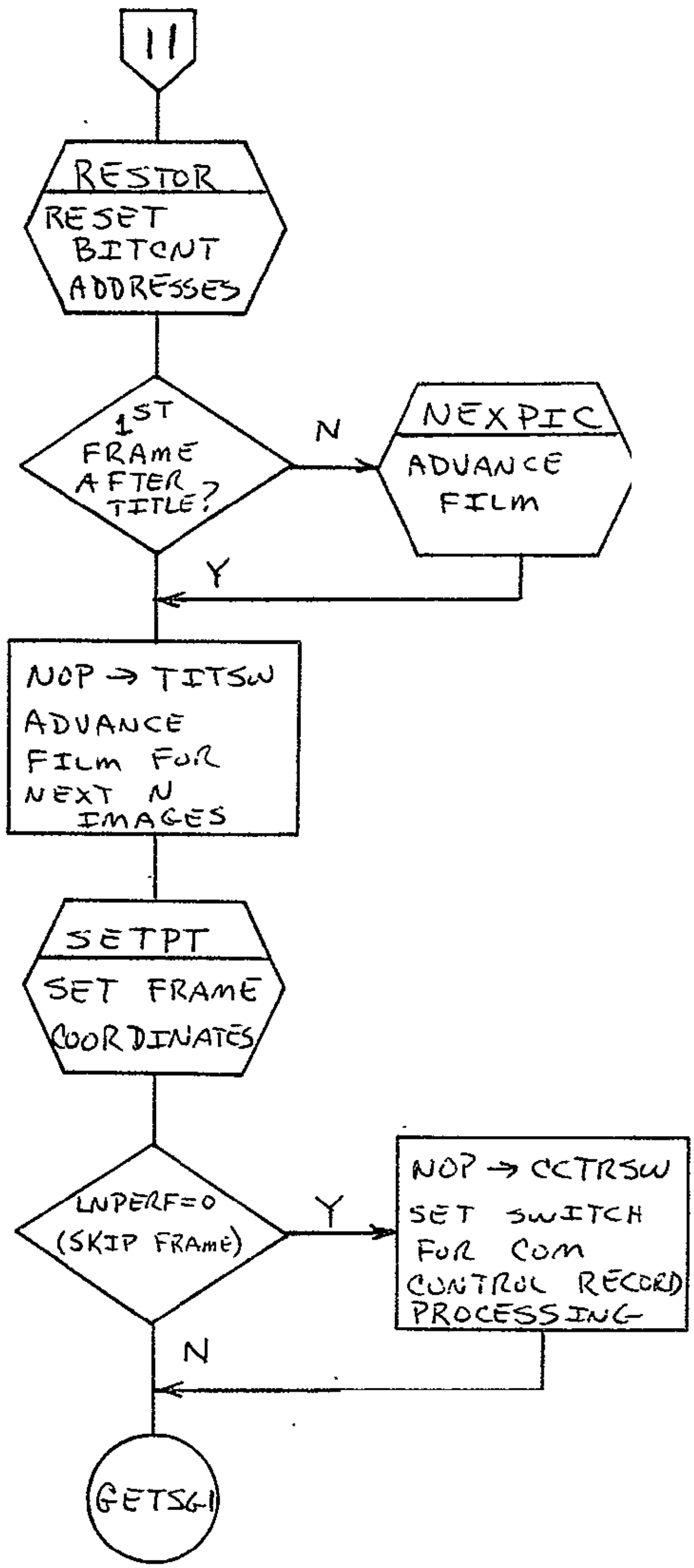

8
BITCNT
NEXT CHAR.
STORE IN COM CONTROL BUFFER VIA A.I.R. 11
CHAR= #?
N
MVCOM2
Y
EXIT

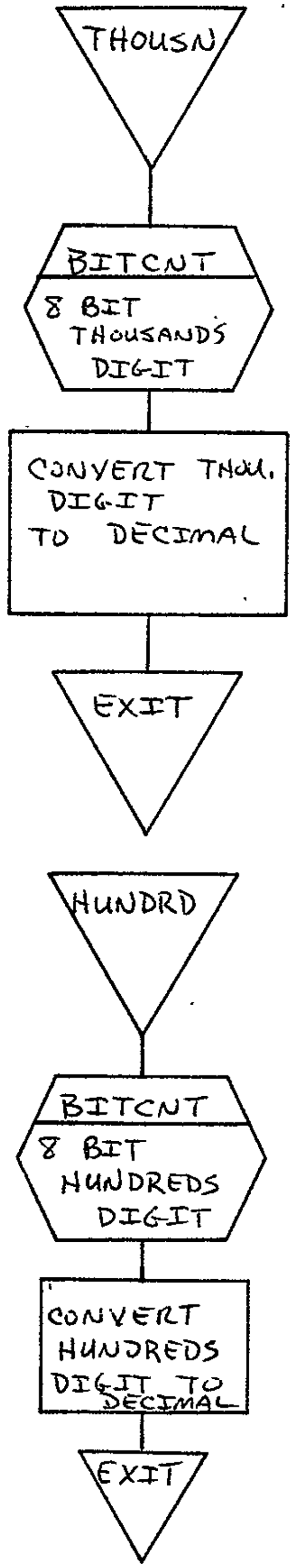

GRACTL
SET PROCESSING SWITCHES FOR GRAY DATA
HEXOCT
SAVADD
SAVE BITCNT ADDRESSES
BITCNT
BIT BUCKET BYTES 3 & 4 OF CONTROL RECORD
THOUSN
GET THOUSANDS COUNT
CLASS DATA?
Y
0 → AC
CLASS NEVER OVER HUNDREDS
N
9

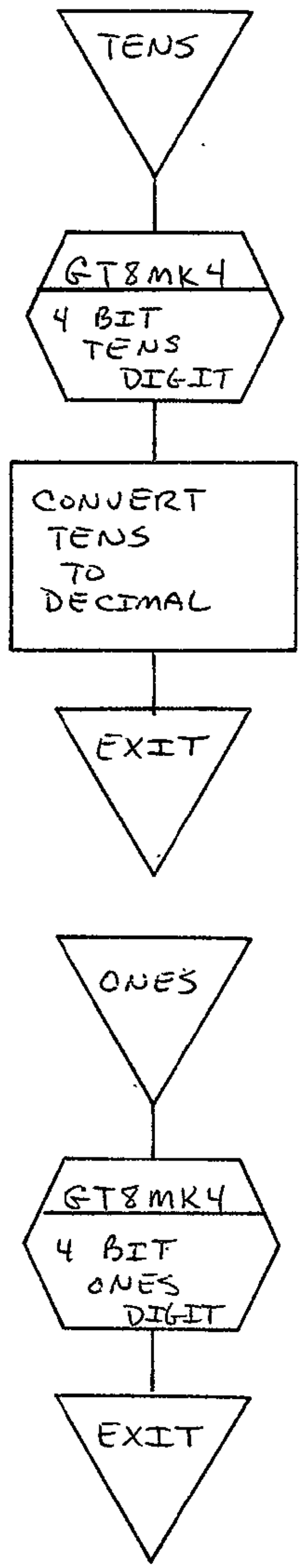

9
THOUSANDS
→ CHPERL
PIXELS OR
CHAR. PER
LINE COUNT
HUNDRD
GET
HUNDREDS
DIGIT
HUNDREDS +
CHPERL
→ CHPERL
TENS
GET
TENS
DIGIT
TENS +
CHPERL
→ CHPERL
ONES
GET
ONES
DIGIT
10

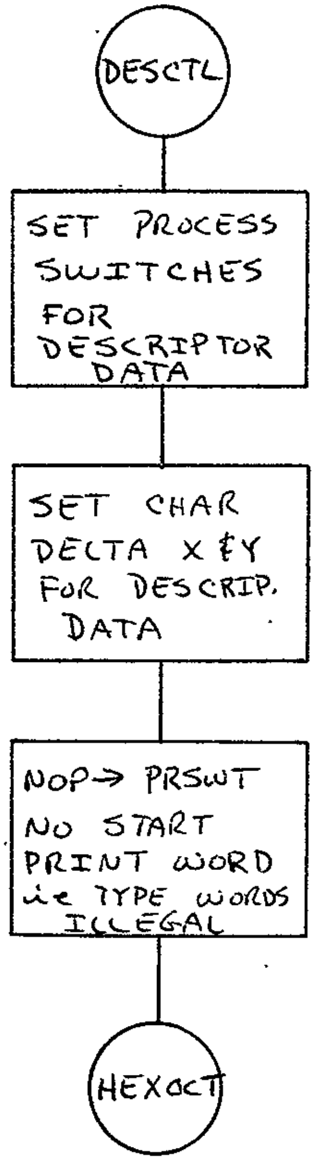


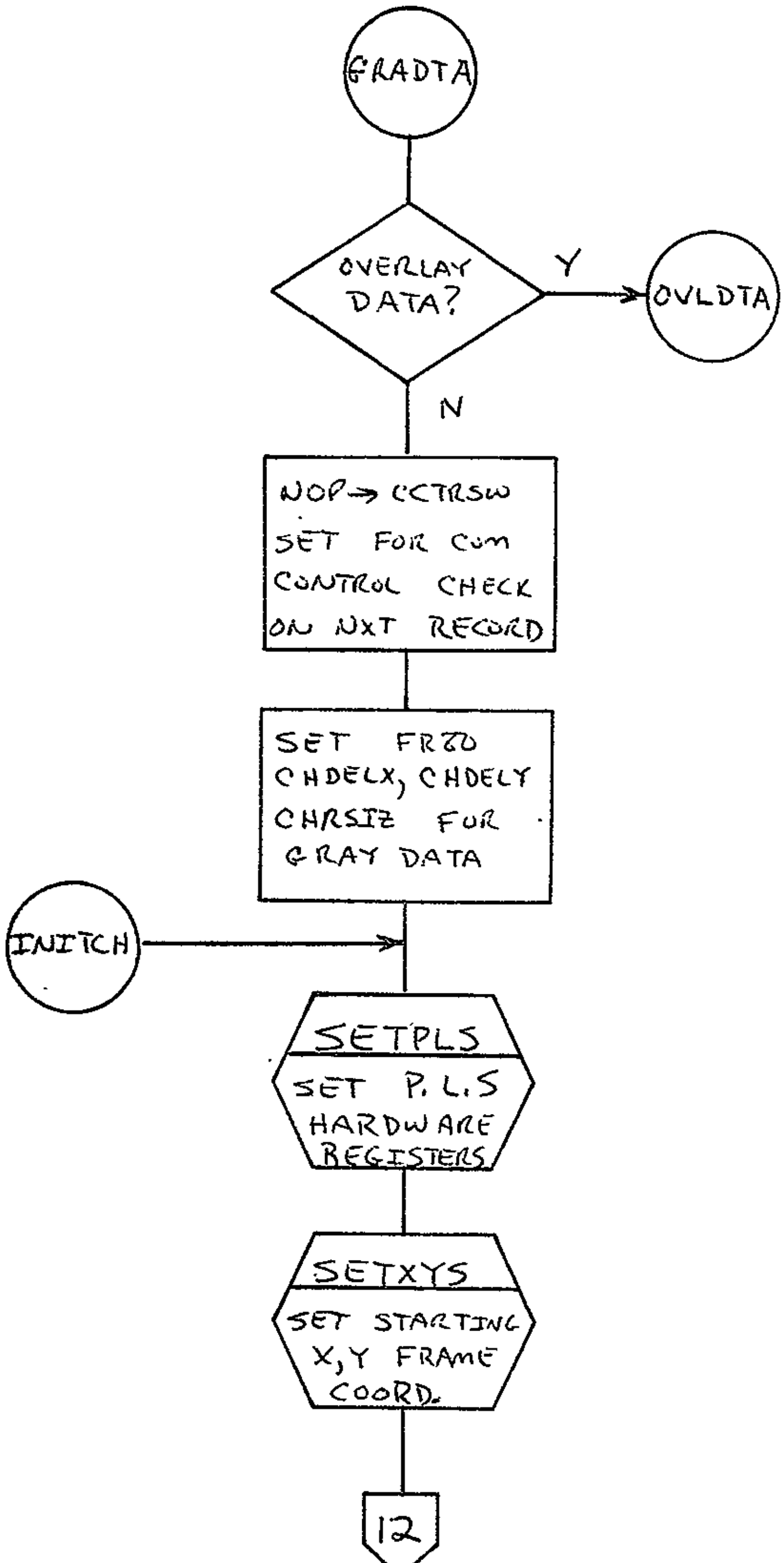
REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR

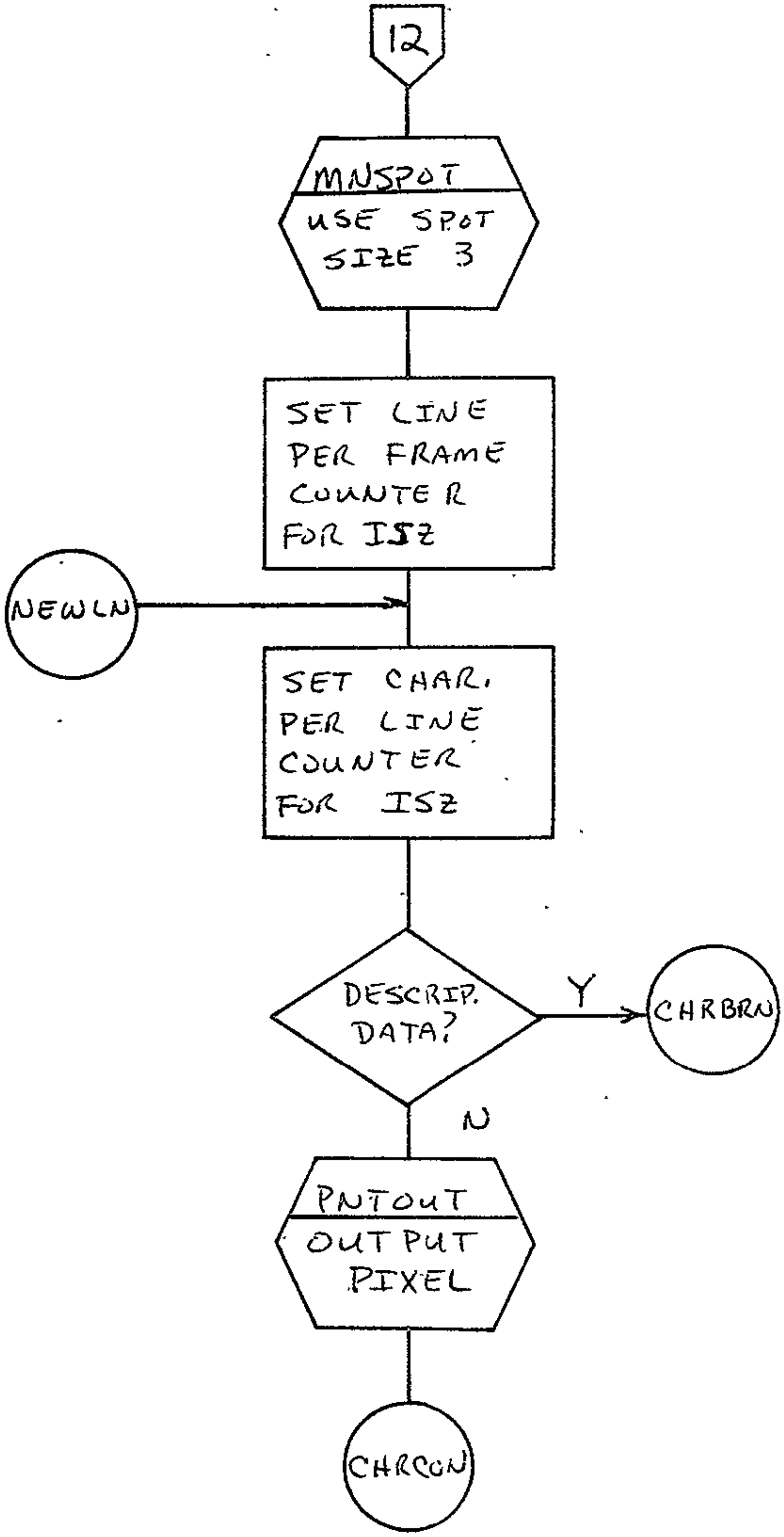

11
RESTOR
RESET BITCNT ADDRESSES
1ST FRAME AFTER TITLE?
N
NEXPIC
ADVANCE FILM
Y
NOP → TITSW
ADVANCE FILM FOR NEXT N IMAGES
SETPT
SET FRAME COORDINATES
LNPERF=0 (SKIP FRAME)
Y
NOP → CCTRSW
SET SWITCH FOR COM CONTROL RECORD PROCESSING
N
GETSG1

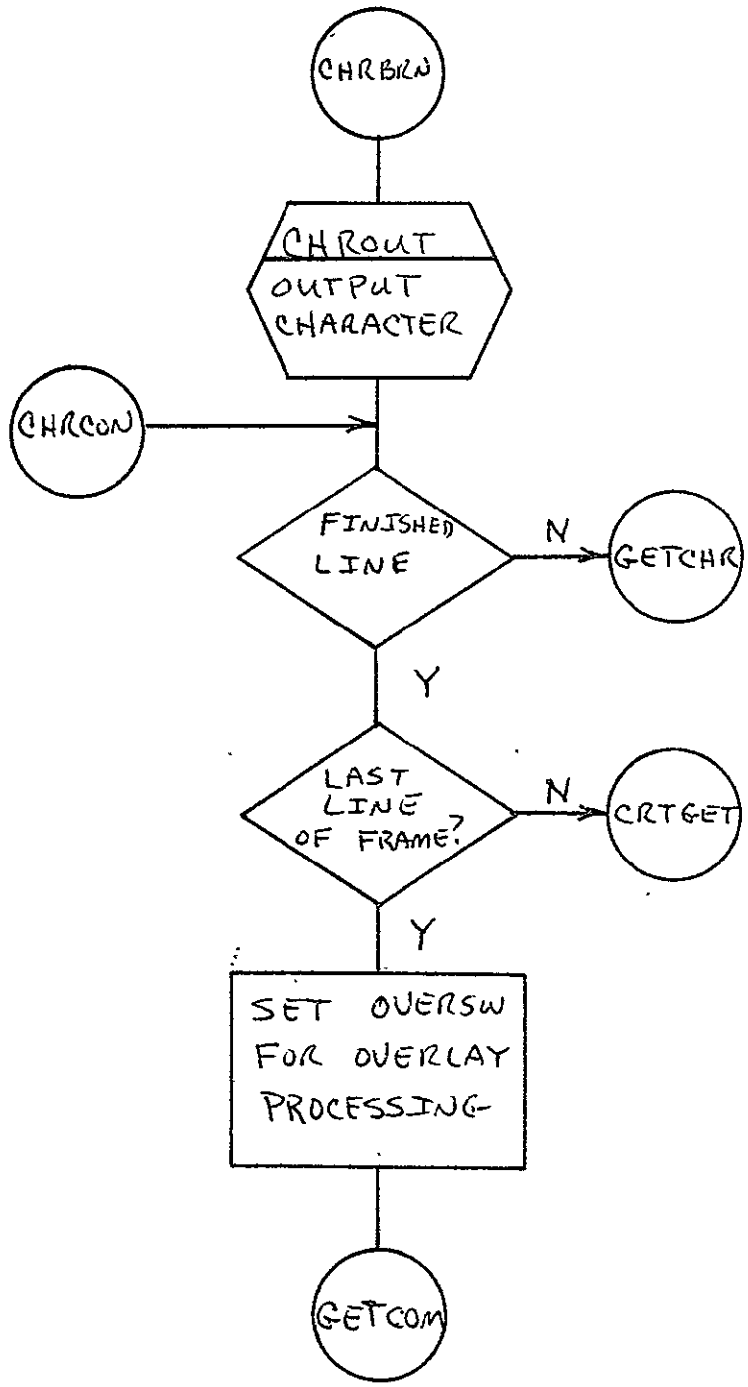

THOUSN
BITCNT
8 BIT THOUSANDS DIGIT
CONVERT THOU. DIGIT TO DECIMAL
EXIT
HUNDRD
BITCNT
8 BIT HUNDREDS DIGIT
CONVERT HUNDREDS DIGIT TO DECIMAL
EXIT

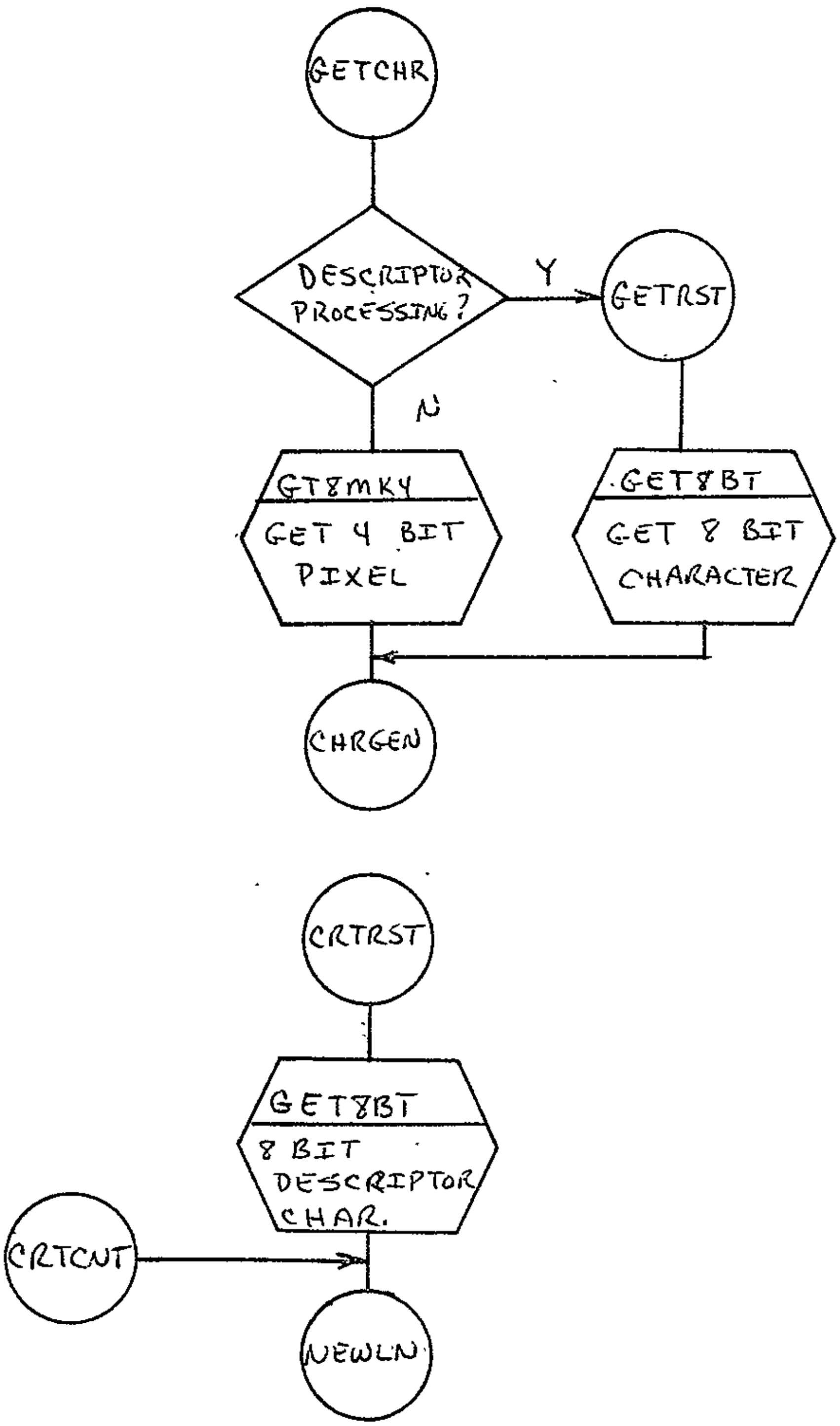

TENS
GT8MK4
4 BIT
TENS
DIGIT
CONVERT
TENS
TO
DECIMAL
EXIT
ONES
GT8MK4
4 BIT
ONES
DIGIT
EXIT

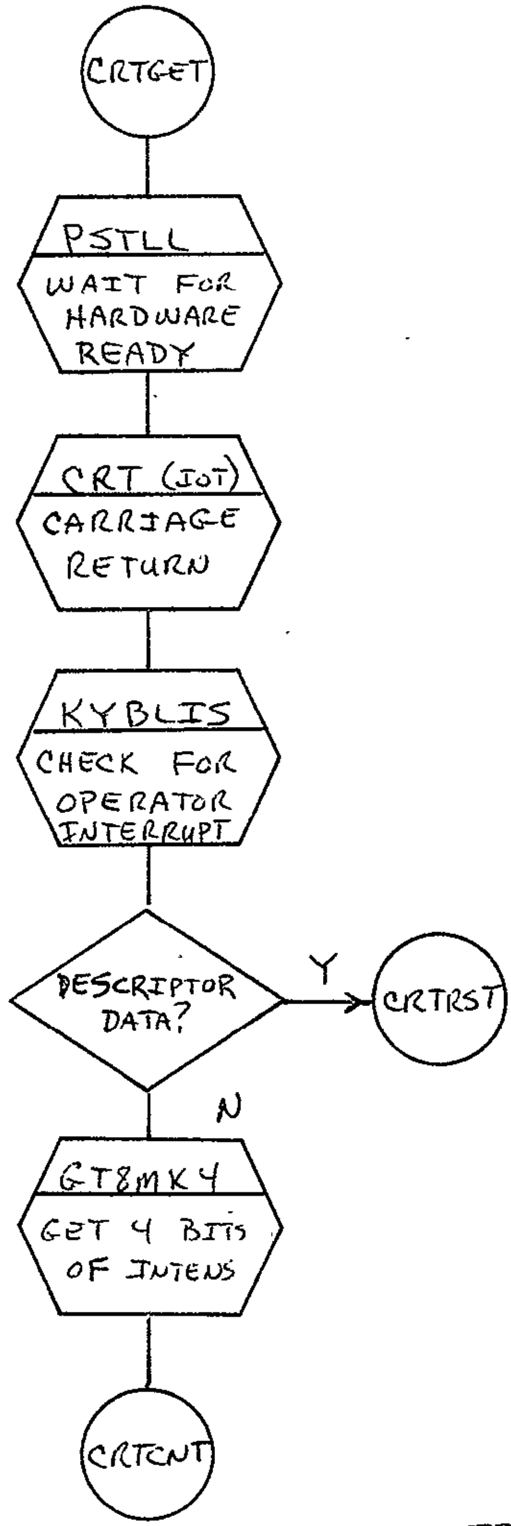

DESCTL
SET PROCESS SWITCHES FOR DESCRIPTOR DATA
SET CHAR DELTA X & Y FOR DESCRIP. DATA
NOP→ PRSWT NO START PRINT WORD ie TYPE WORDS ILLEGAL
HEXOCT

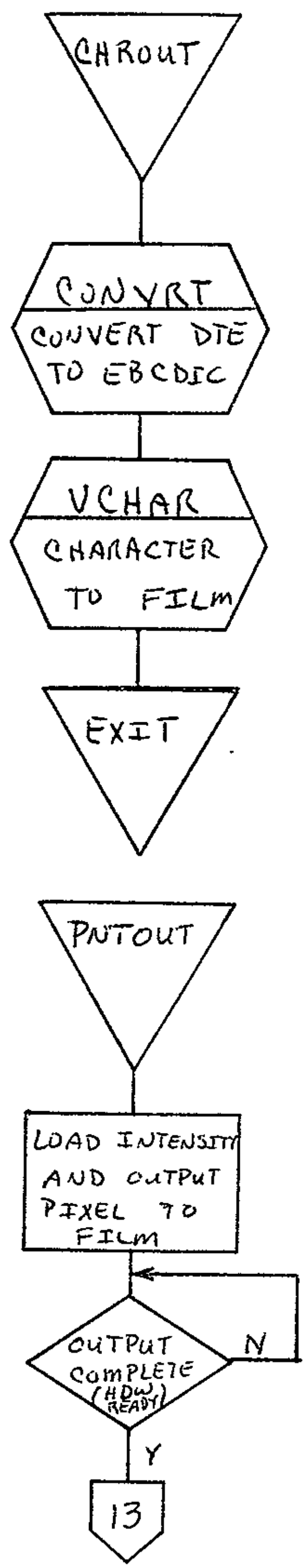

GRADTA
OVERLAY DATA?
Y
OVLDTA
N
NOP→CCTRSW SET FOR COM CONTROL CHECK ON NXT RECORD
SET FR80 CHDELX, CHDELY CHRSIZ FOR GRAY DATA
INITCH
SETPLS
SET P.L.S HARDWARE REGISTERS
SETXYS
SET STARTING X,Y FRAME COORD.
12

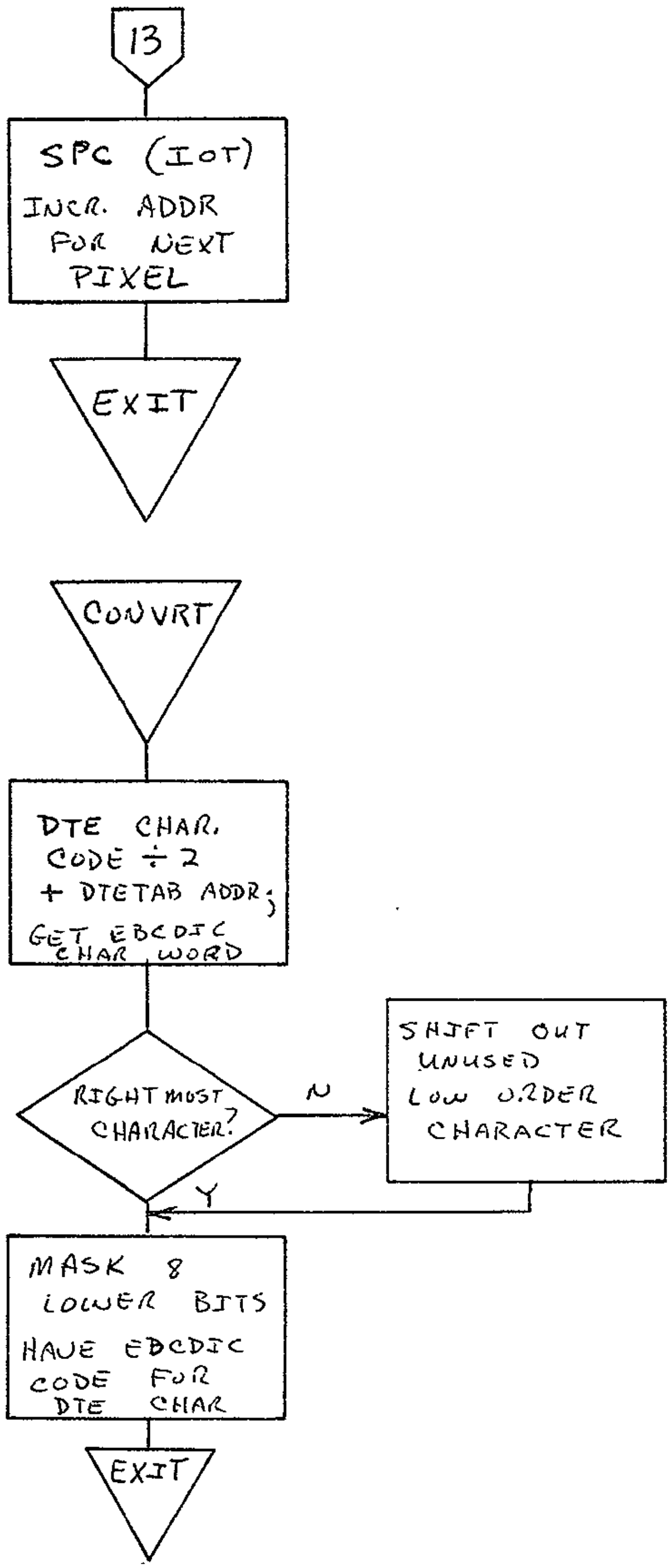

12
MNSPOT
USE SPOT SIZE 3
SET LINE PER FRAME COUNTER FOR ISZ
NEWLN
SET CHAR. PER LINE COUNTER FOR ISZ
DESCRIP. DATA?
Y
CHRBRN
N
PNTOUT
OUTPUT PIXEL
CHRCON

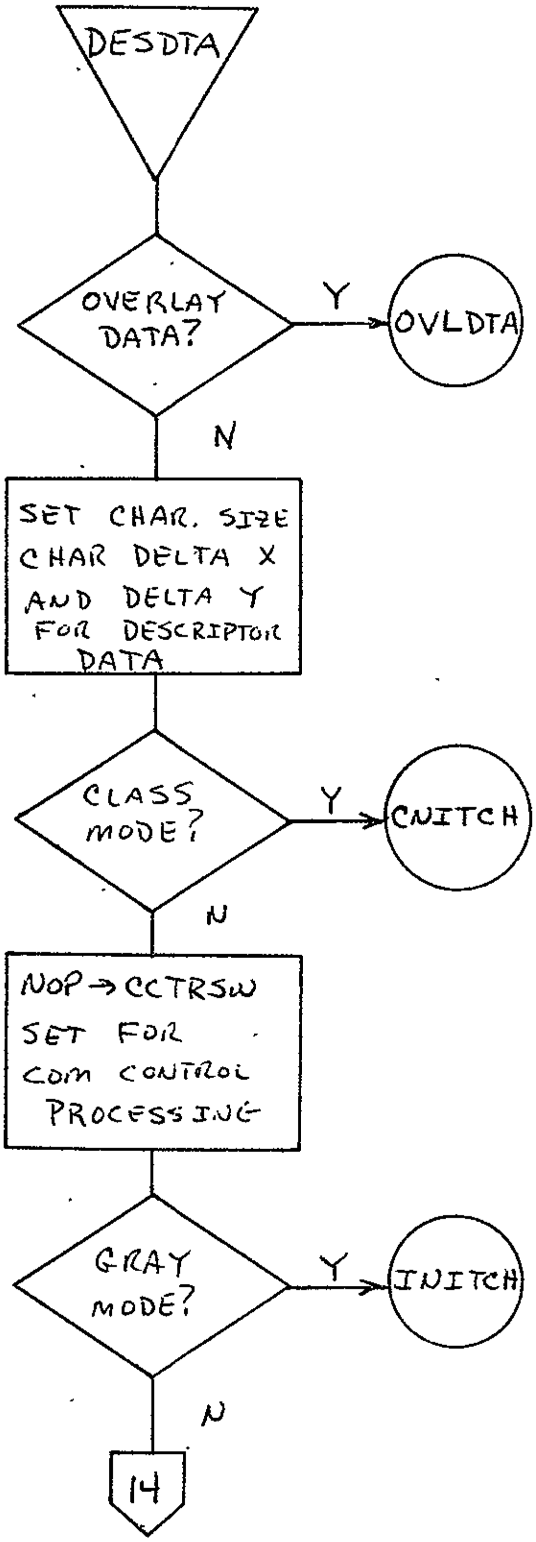

CHRBRN
CHROUT
OUTPUT CHARACTER
CHRCON
FINISHED LINE
N
GETCHR
Y
LAST LINE OF FRAME?
N
CRTGET
Y
SET OVERSW FOR OVERLAY PROCESSING
GETCOM

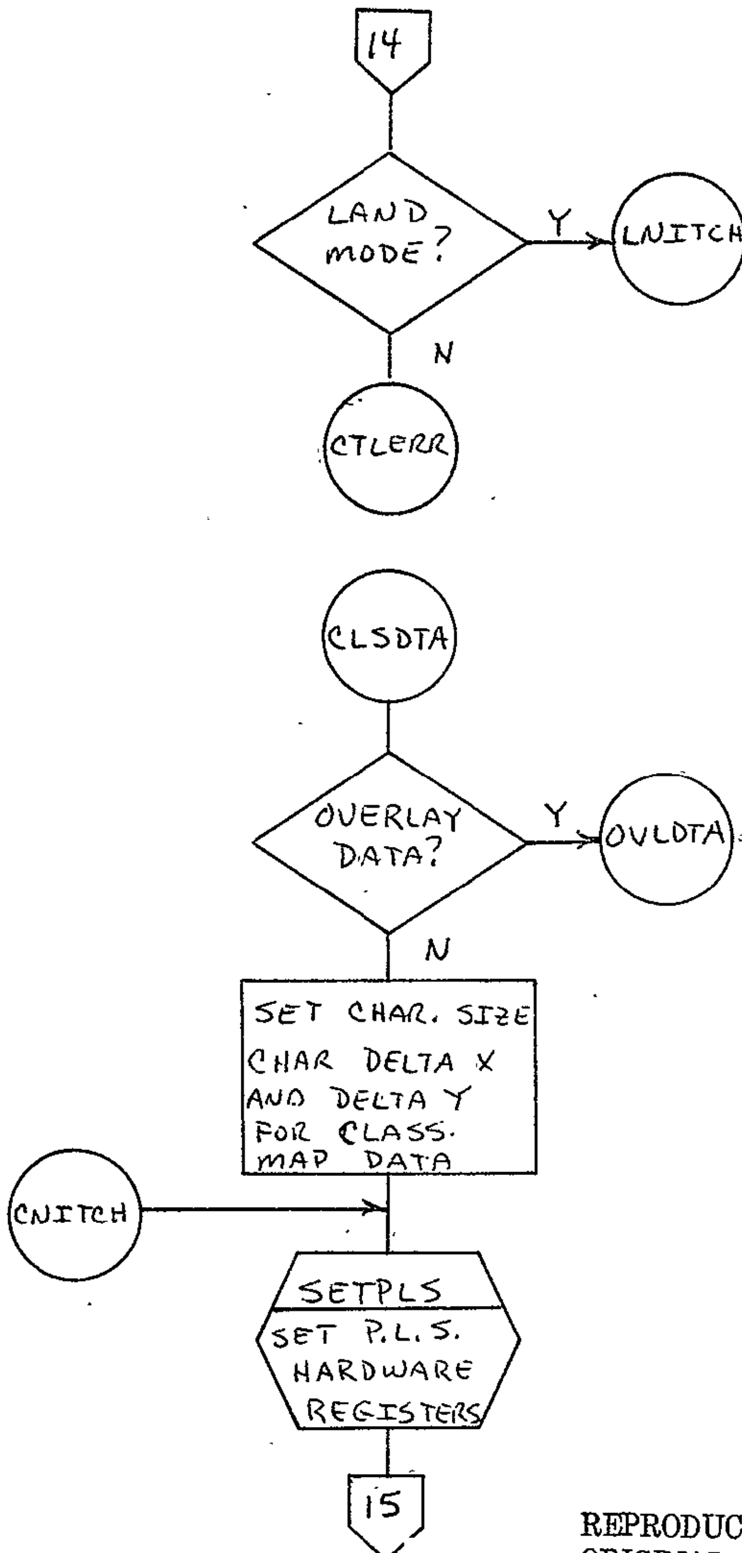

GETCHR
DESCRIPTOR PROCESSING?
Y
N
GETRST
GT8MKY
GET 4 BIT PIXEL
GET8BT
GET 8 BIT CHARACTER
CHRGEN
CRTRST
GET8BT
8 BIT DESCRIPTOR CHAR.
CRTCNT
NEWLN


CRTGET
PSTLL
WAIT FOR HARDWARE READY
CRT (IOT)
CARRIAGE RETURN
KYBLIS
CHECK FOR OPERATOR INTERRUPT
DESCRIPTOR DATA?
Y
CRTRST
N
GT8MK4
GET 4 BITS OF INTENS
CRTCNT

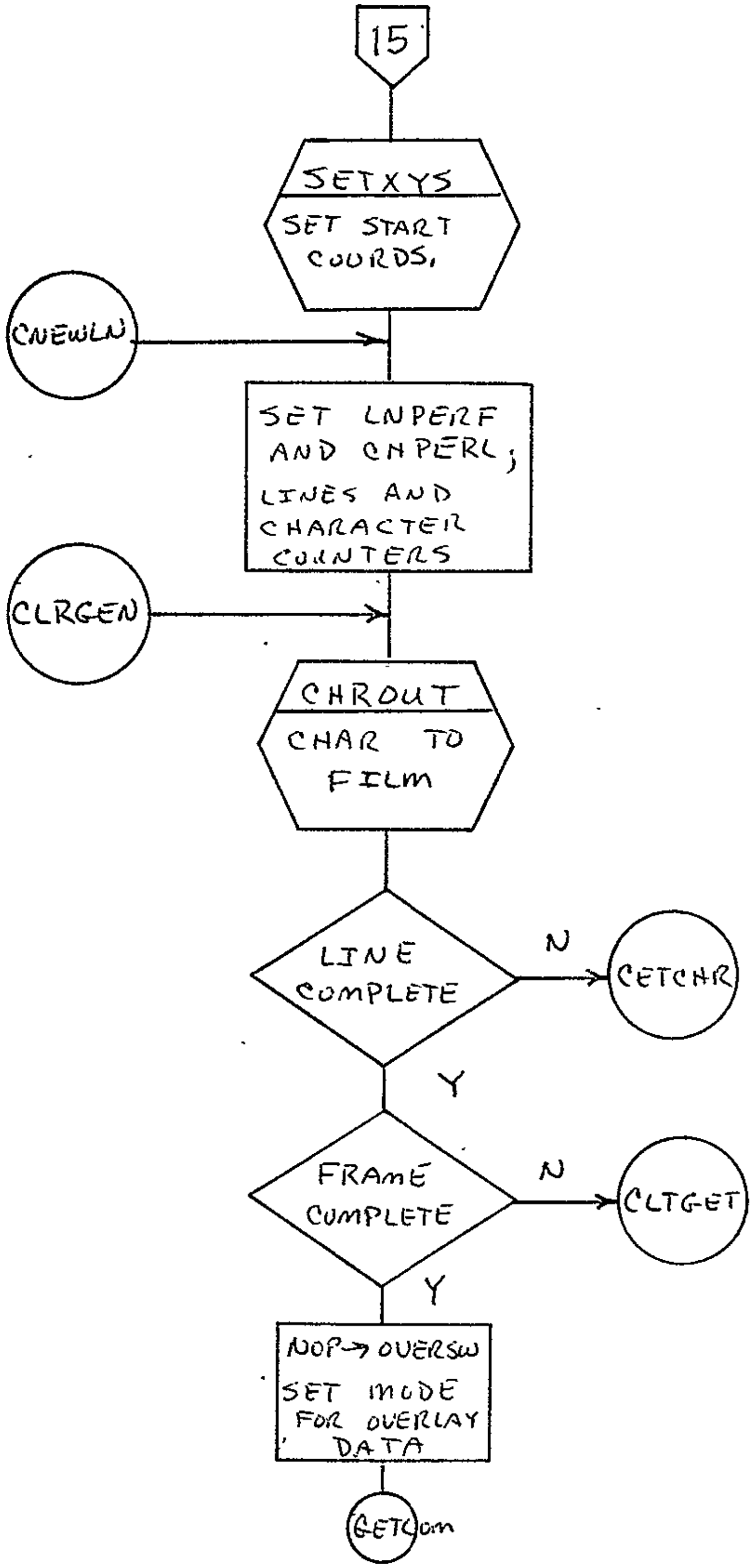

CHROUT
CONVRT
CONVERT DTE TO EBCDIC
VCHAR
CHARACTER TO FILM
EXIT
PNTOUT
LOAD INTENSITY AND OUTPUT PIXEL TO FILM
OUTPUT COMPLETE (HDW READY)
N
Y
13

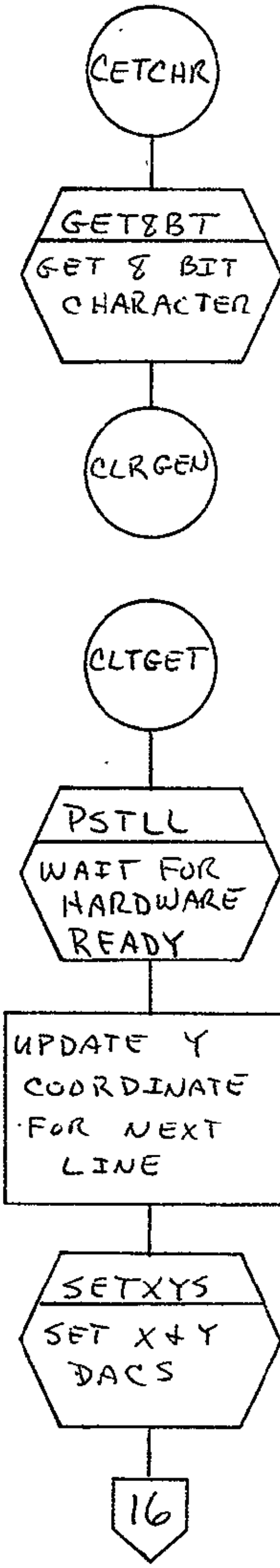

13
SPC (IOT)
INCR. ADDR FOR NEXT PIXEL
EXIT
CONVRT
DTE CHAR. CODE ÷ 2 + DTETAB ADDR;
GET EBCDIC CHAR WORD
RIGHT MOST CHARACTER?
N
SHIFT OUT UNUSED LOW ORDER CHARACTER
Y
MASK 8 LOWER BITS
HAVE EBCDIC CODE FOR DTE CHAR
EXIT

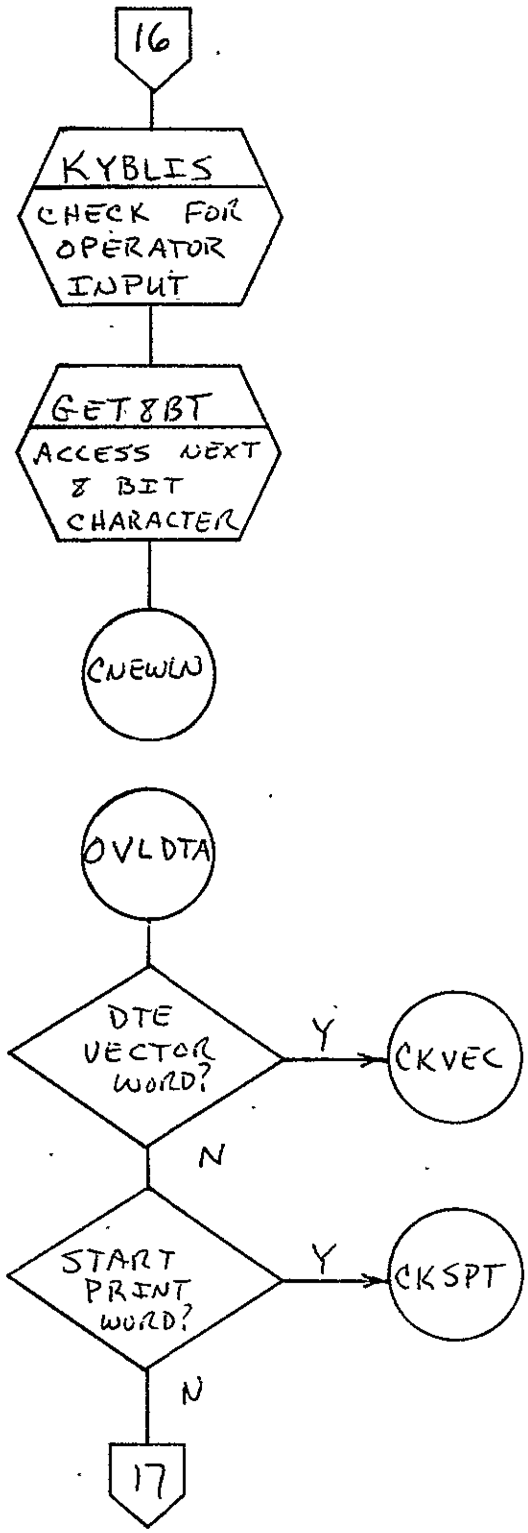

DESDTA
OVERLAY DATA?
Y
OVLDTA
N
SET CHAR. SIZE CHAR DELTA X AND DELTA Y FOR DESCRIPTOR DATA
CLASS MODE?
Y
CNITCH
N
NOP → CCTRSW SET FOR COM CONTROL PROCESSING
GRAY MODE?
Y
INITCH
N
14

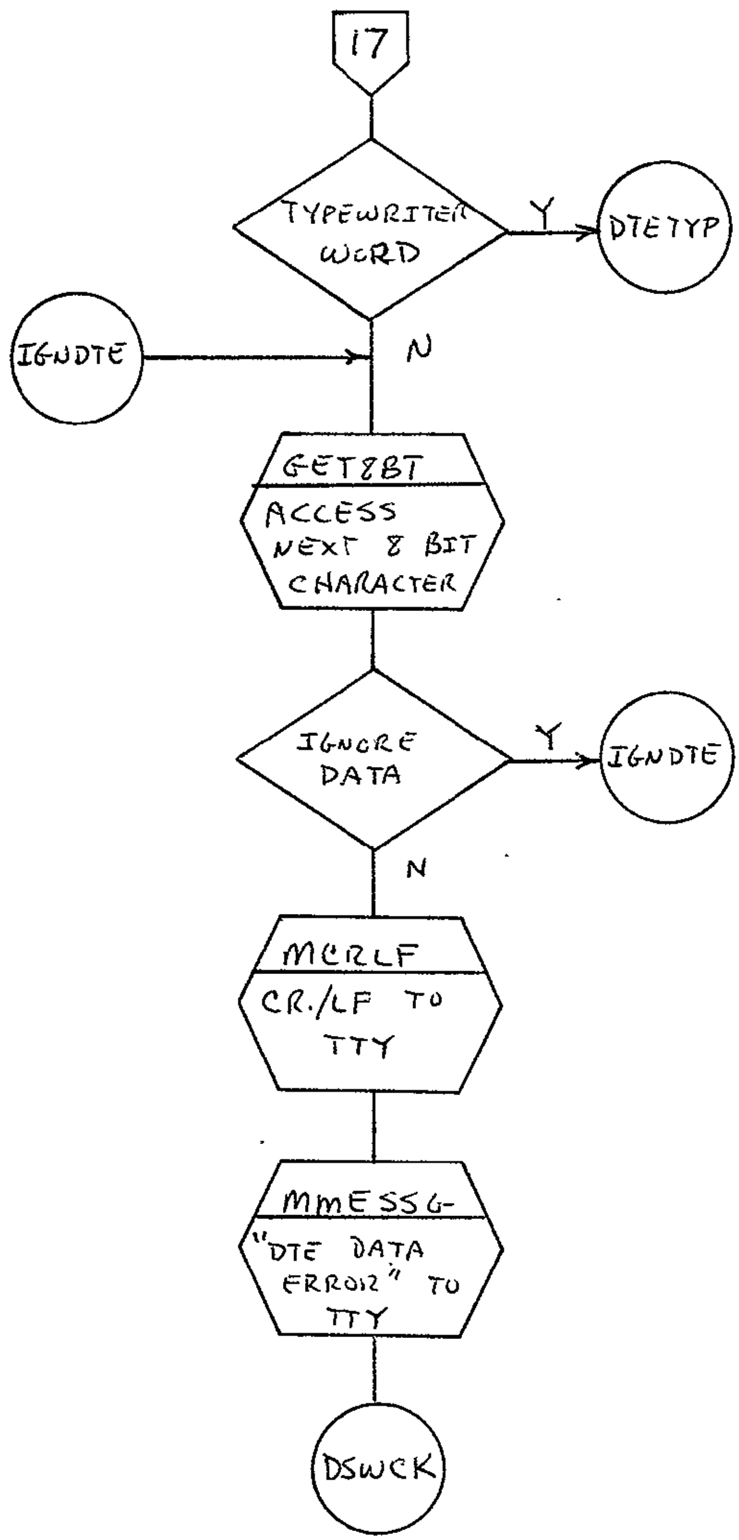


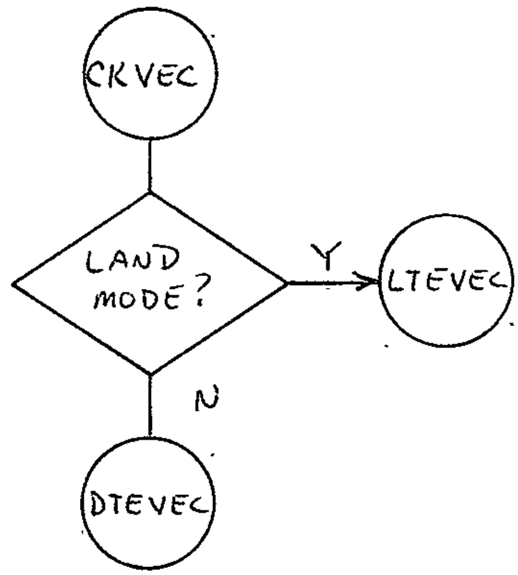
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

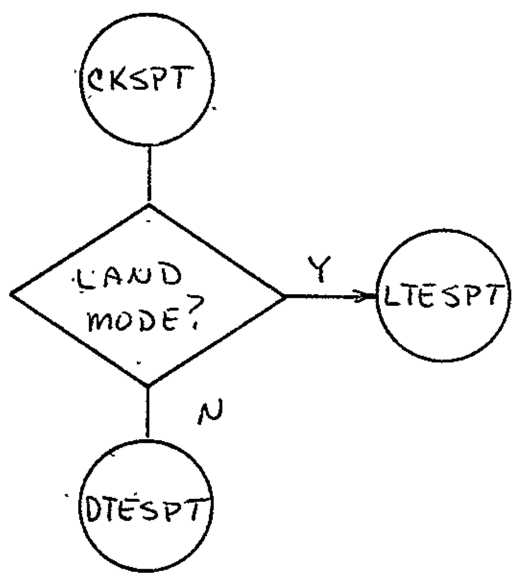

15
SETXYS
SET START COORDS.
CNEWLN
SET LNPERF AND CNPERL;
LINES AND CHARACTER COUNTERS
CLRGEN
CHROUT
CHAR TO FILM
LINE COMPLETE
N
CETCHR
Y
FRAME COMPLETE
N
CLTGET
Y
NOP→OVERSW
SET MODE FOR OVERLAY DATA
GETCom

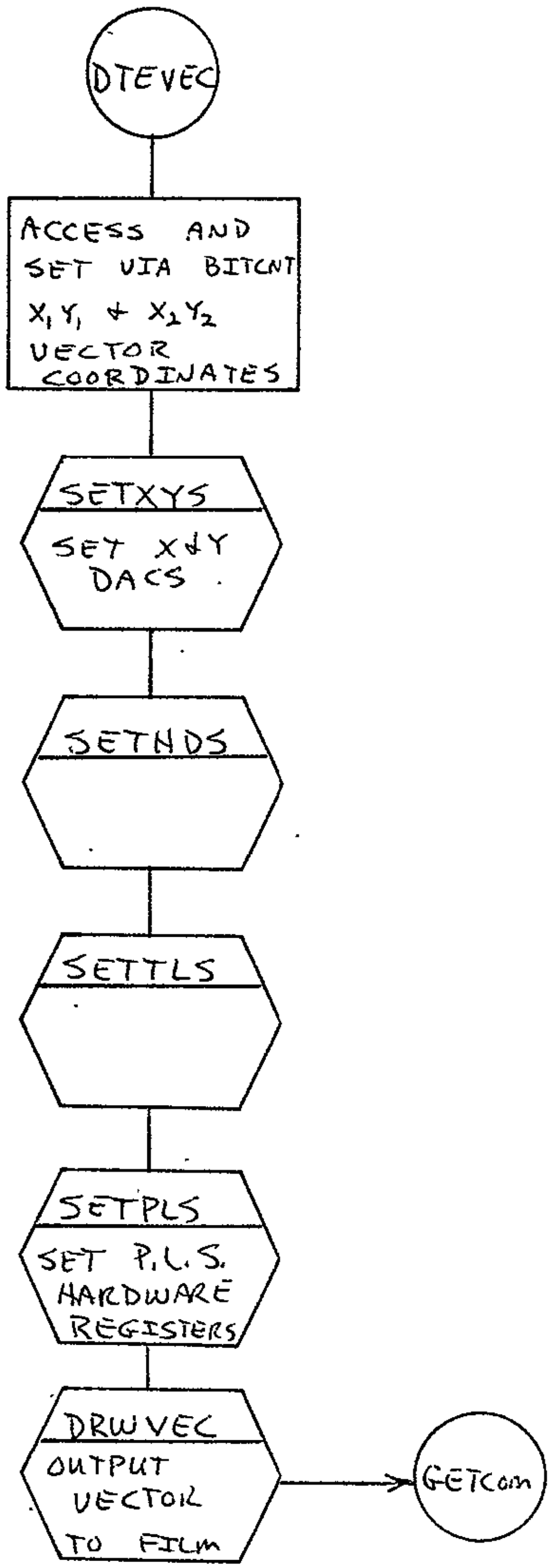

GETCHR
GET8BT
GET 8 BIT CHARACTER
CLRGEN
CLTGET
PSTLL
WAIT FOR HARDWARE READY
UPDATE Y COORDINATE FOR NEXT LINE
SETXYS
SET X + Y DACS
16

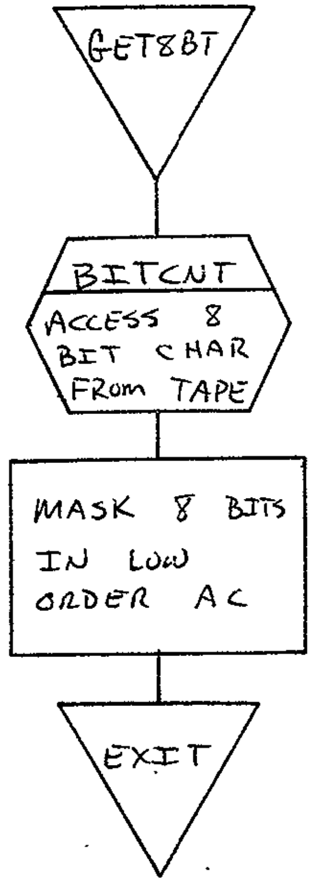

16
KYBLIS
CHECK FOR OPERATOR INPUT
GET8BT
ACCESS NEXT 8 BIT CHARACTER
CNEWLN
OVLDTA
DTE VECTOR WORD?
Y
CKVEC
N
START PRINT WORD?
Y
CKSPT
N
17

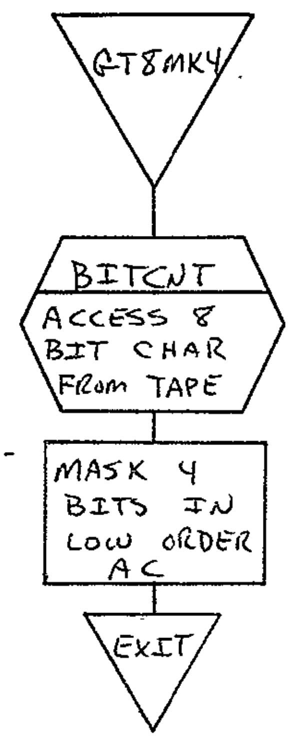

17
TYPEWRITER WORD
Y
DTETYP
IGNDTE
N
GET8BT
ACCESS NEXT 8 BIT CHARACTER
IGNORE DATA
Y
IGNDTE
N
MCRLF
CR./LF TO TTY
MMESSG
"DTE DATA ERROR" TO TTY
DSWCK

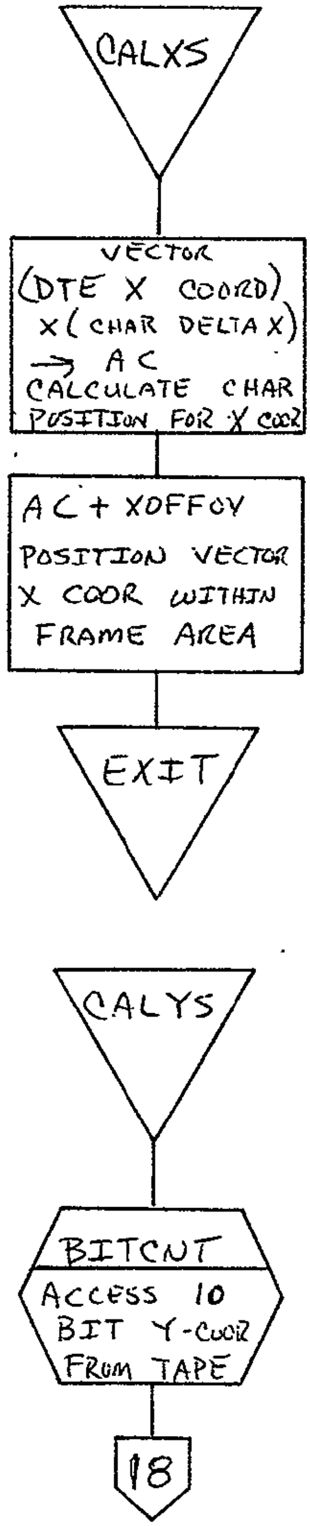

CKVEC
LAND MODE?
Y
LTEVEC
N
DTEVEC

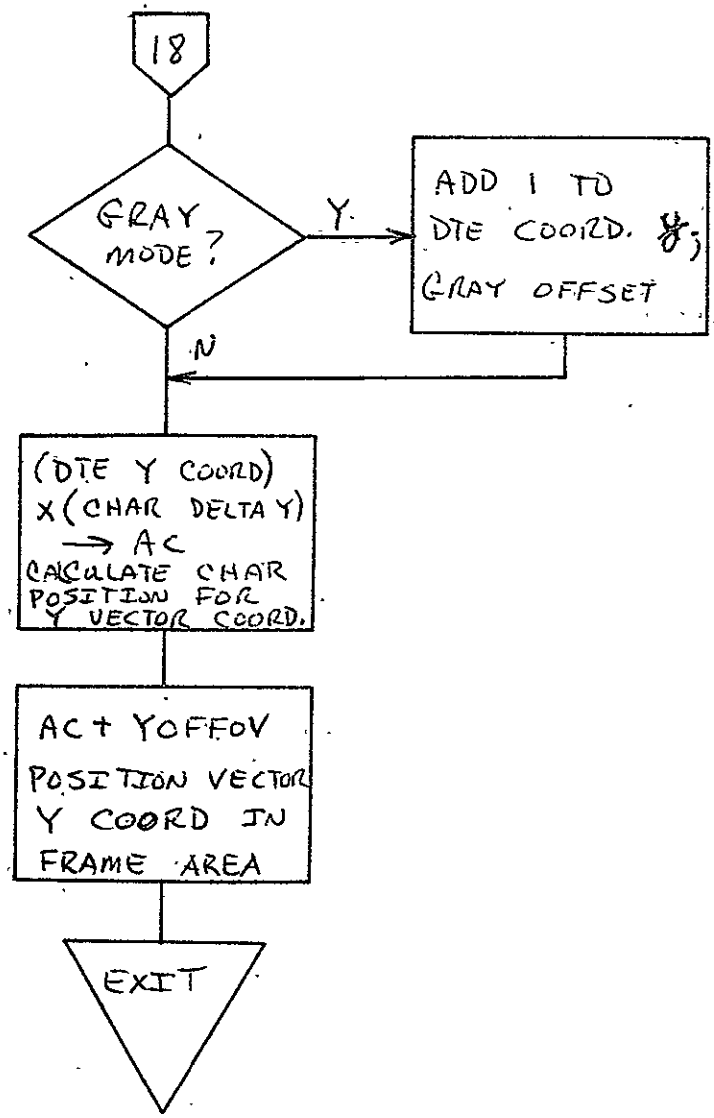

CKSPT
LAND MODE?
Y
LTESPT
N
DTESPT

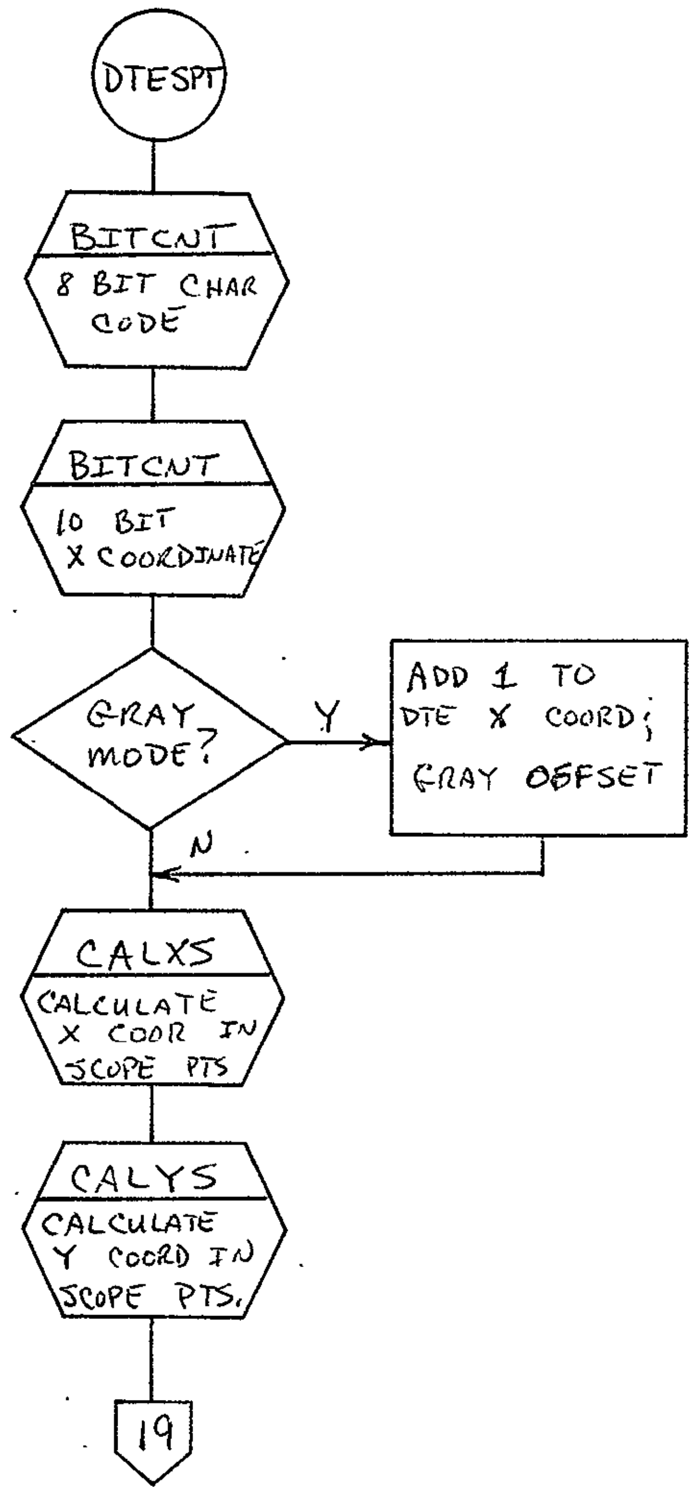

DTEVEC
ACCESS AND SET VIA BITCNT X_1Y_1 & X_2Y_2 VECTOR COORDINATES
SETXYS
SET X&Y DACS
SETHDS
SETTLS
SETPLS
SET P.L.S. HARDWARE REGISTERS
DRWVEC
OUTPUT VECTOR TO FILM
GETCOM

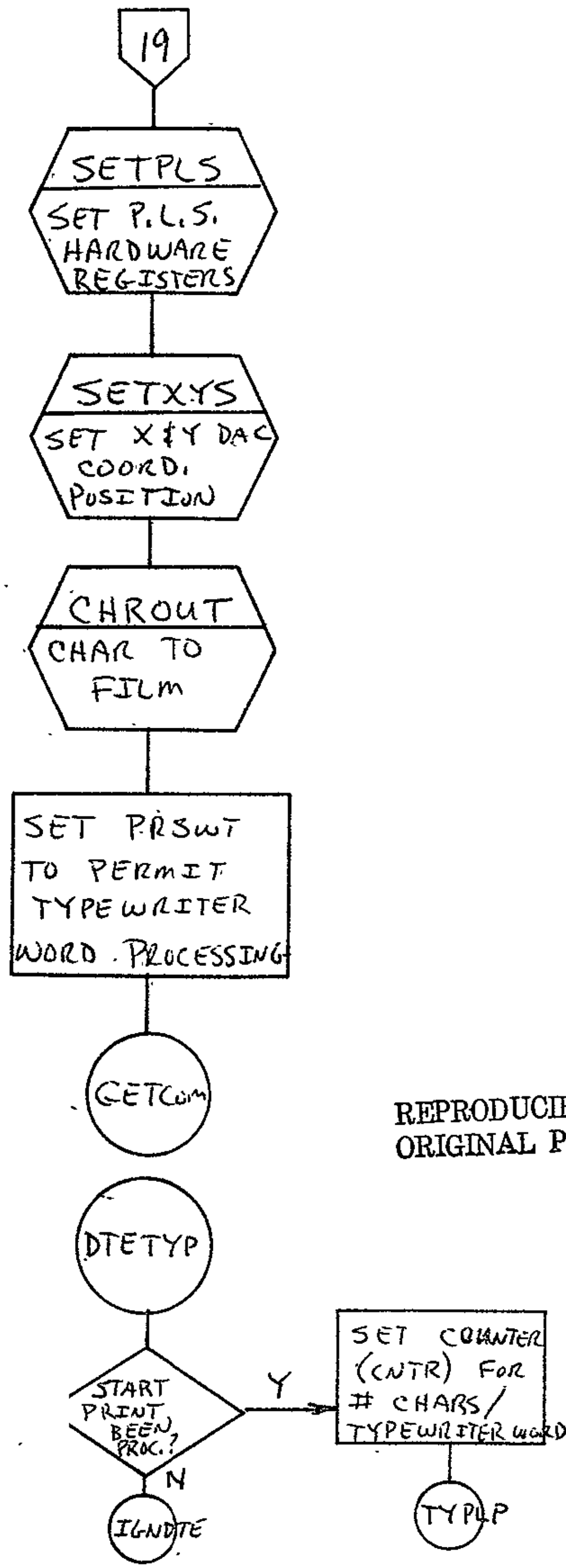

GET8BT
BITCNT
ACCESS 8
BIT CHAR
FROM TAPE
MASK 8 BITS
IN LOW
ORDER AC
EXIT

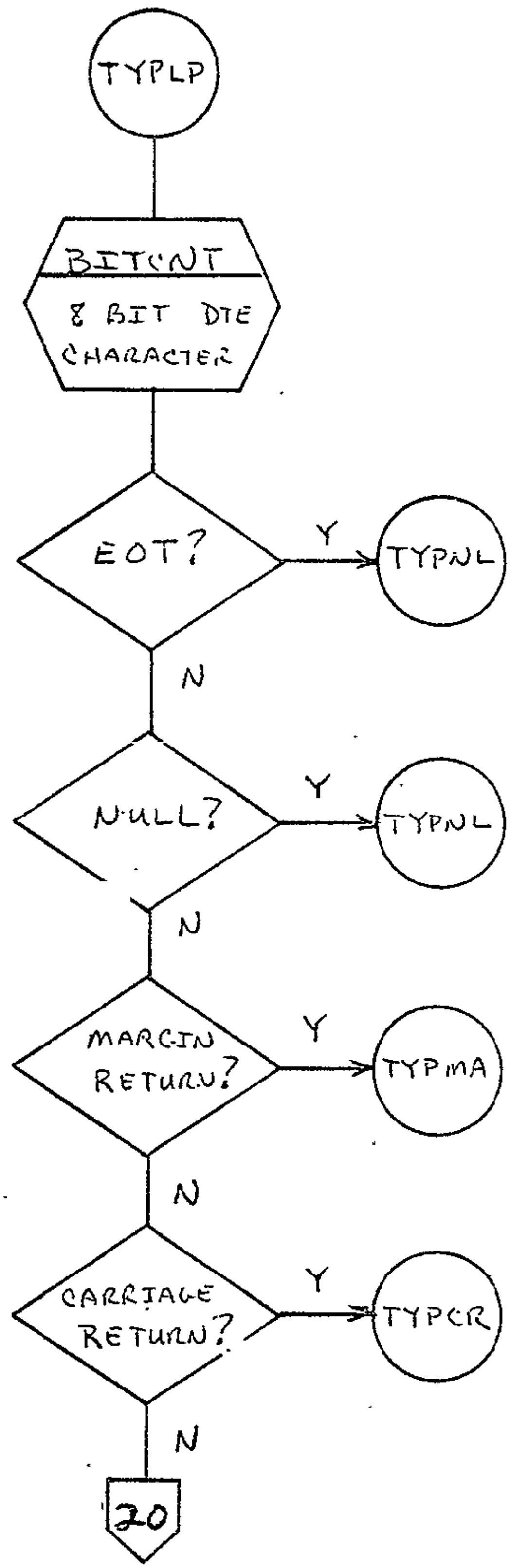

GT8MK4
BITCNT
ACCESS 8
BIT CHAR
FROM TAPE
MASK 4
BITS IN
LOW ORDER
AC
EXIT

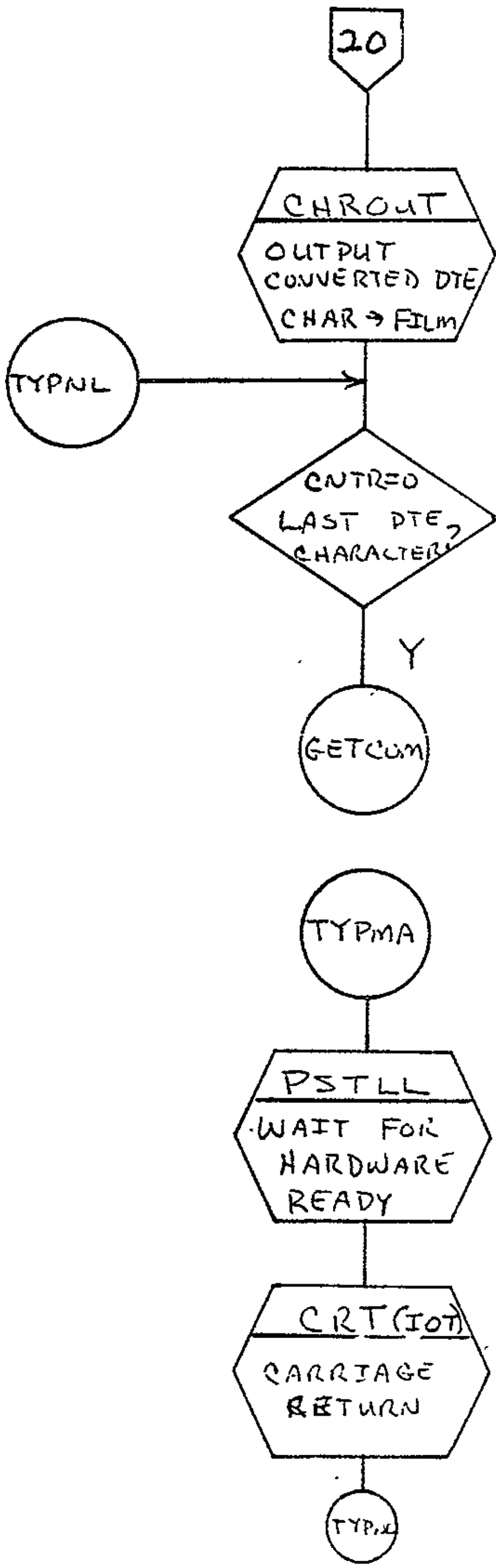

CALXS
VECTOR (DTE X COORD) X (CHAR DELTA X) → AC
CALCULATE CHAR POSITION FOR X COOR
AC + XOFFOV
POSITION VECTOR X COOR WITHIN FRAME AREA
EXIT
CALYS
BITCNT
ACCESS 10 BIT Y-COOR FROM TAPE
18

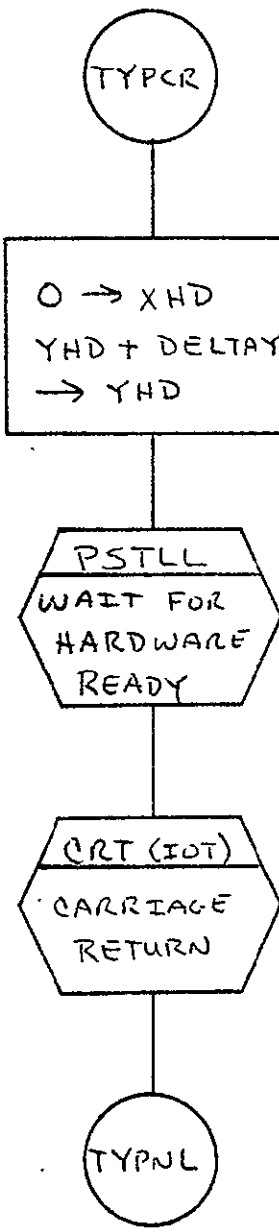

18
GRAY MODE?
Y
ADD 1 TO DTE COORD. Y;
GRAY OFFSET
N
(DTE Y COORD) X (CHAR DELTA Y) → AC
CALCULATE CHAR POSITION FOR Y VECTOR COORD.
AC + YOFFOV
POSITION VECTOR Y COORD IN FRAME AREA
EXIT

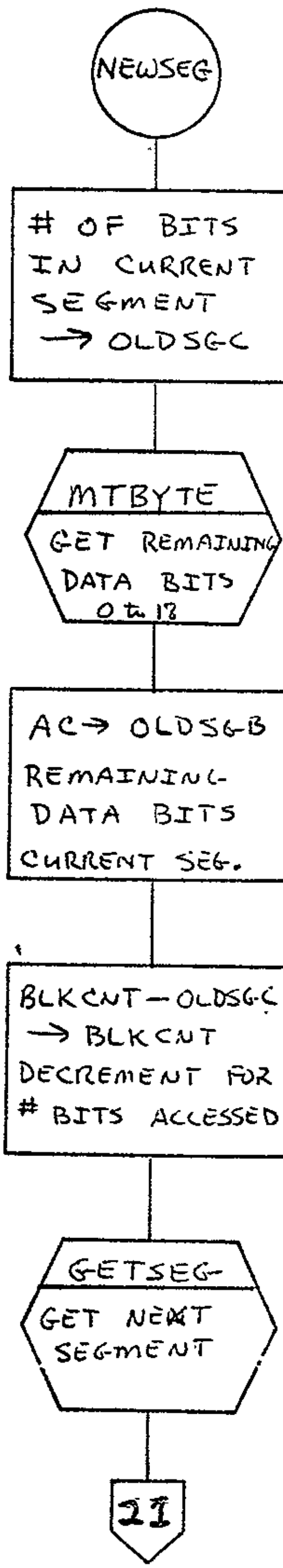

DTESPT
BITCNT
8 BIT CHAR CODE
BITCNT
10 BIT X COORDINATE
GRAY MODE?
Y
ADD 1 TO DTE X COORD;
GRAY OFFSET
N
CALXS
CALCULATE X COOR IN SCOPE PTS
CALYS
CALCULATE Y COORD IN SCOPE PTS.
19

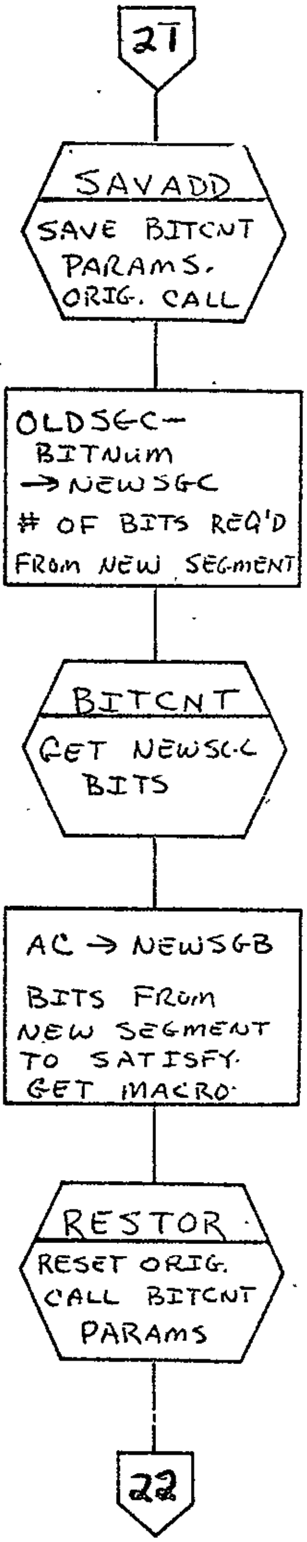

19
SETPLS
SET P.L.S. HARDWARE REGISTERS
SETXYS
SET X&Y DAC COORD. POSITION
CHROUT
CHAR TO FILM
SET PRSWT TO PERMIT TYPEWRITER WORD PROCESSING
GETCOM
DTETYP
START PRINT BEEN PROC.?
Y
N
SET COUNTER (CNTR) FOR # CHARS/ TYPEWRITER WORD
IGNDTE
TYPLP

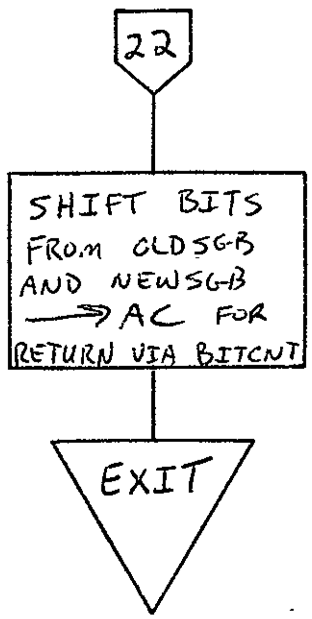

TYPLP
BITCNT
8 BIT DTE CHARACTER
EOT?
Y
TYPNL
N
NULL?
Y
TYPNL
N
MARGIN RETURN?
Y
TYPMA
N
CARRIAGE RETURN?
Y
TYPCR
N
20

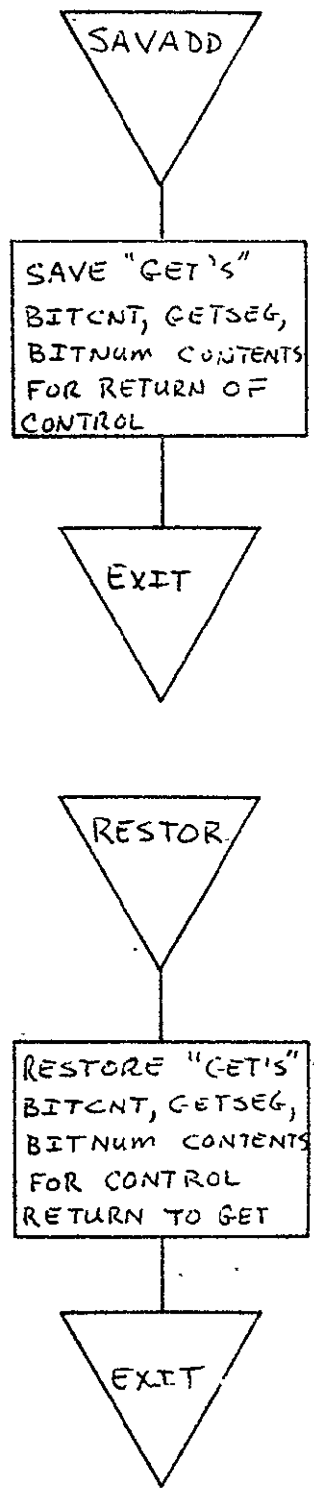

20
CHROUT
OUTPUT CONVERTED DTE CHAR → FILM
TYPNL
CNTR=0 LAST DTE CHARACTER?
N
TYPLP
Y
GETCOM
TYPMA
PSTLL
WAIT FOR HARDWARE READY
CRT(IOT)
CARRIAGE RETURN
TYPNL

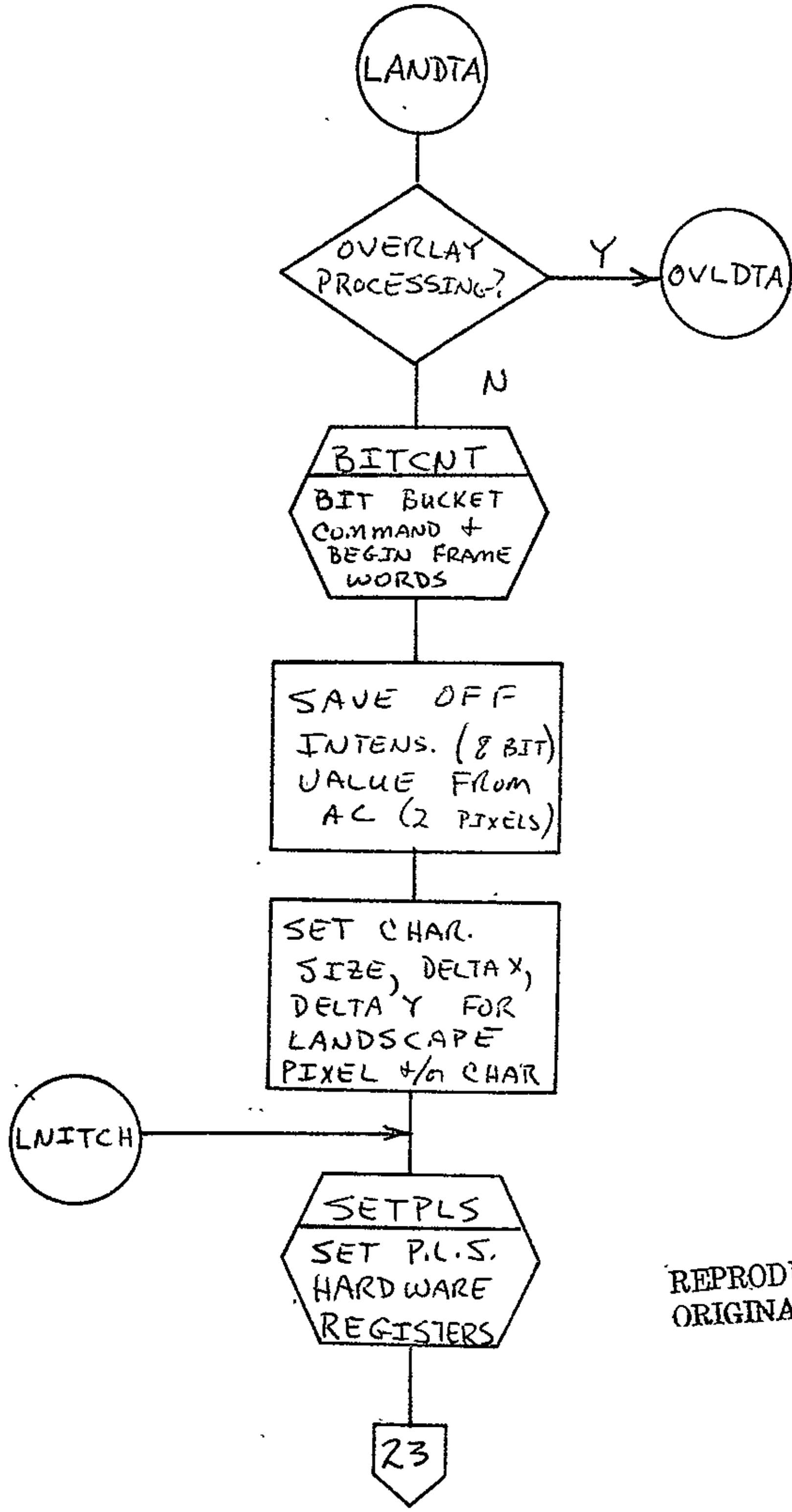

TYPCR
0 → XHD
YHD + DELTAY
→ YHD
PSTLL
WAIT FOR
HARDWARE
READY
CRT (IOT)
CARRIAGE
RETURN
TYPNL

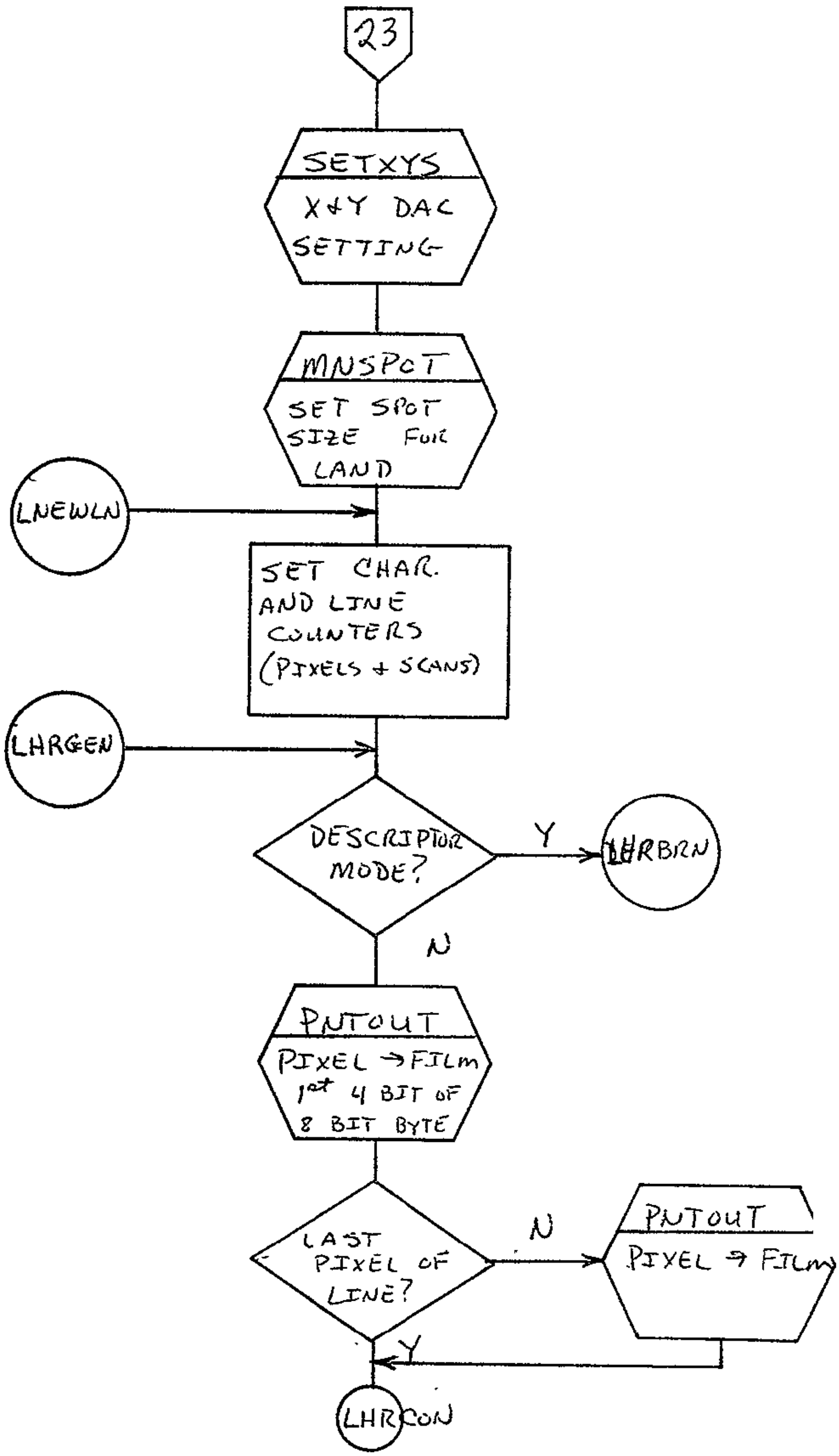

NEWSEG
OF BITS IN CURRENT SEGMENT → OLDSGC
MTBYTE
GET REMAINING DATA BITS 0 to 18
AC → OLDSGB REMAINING DATA BITS CURRENT SEG.
BLKCNT − OLDSGC → BLKCNT DECREMENT FOR # BITS ACCESSED
GETSEG
GET NEXT SEGMENT
21

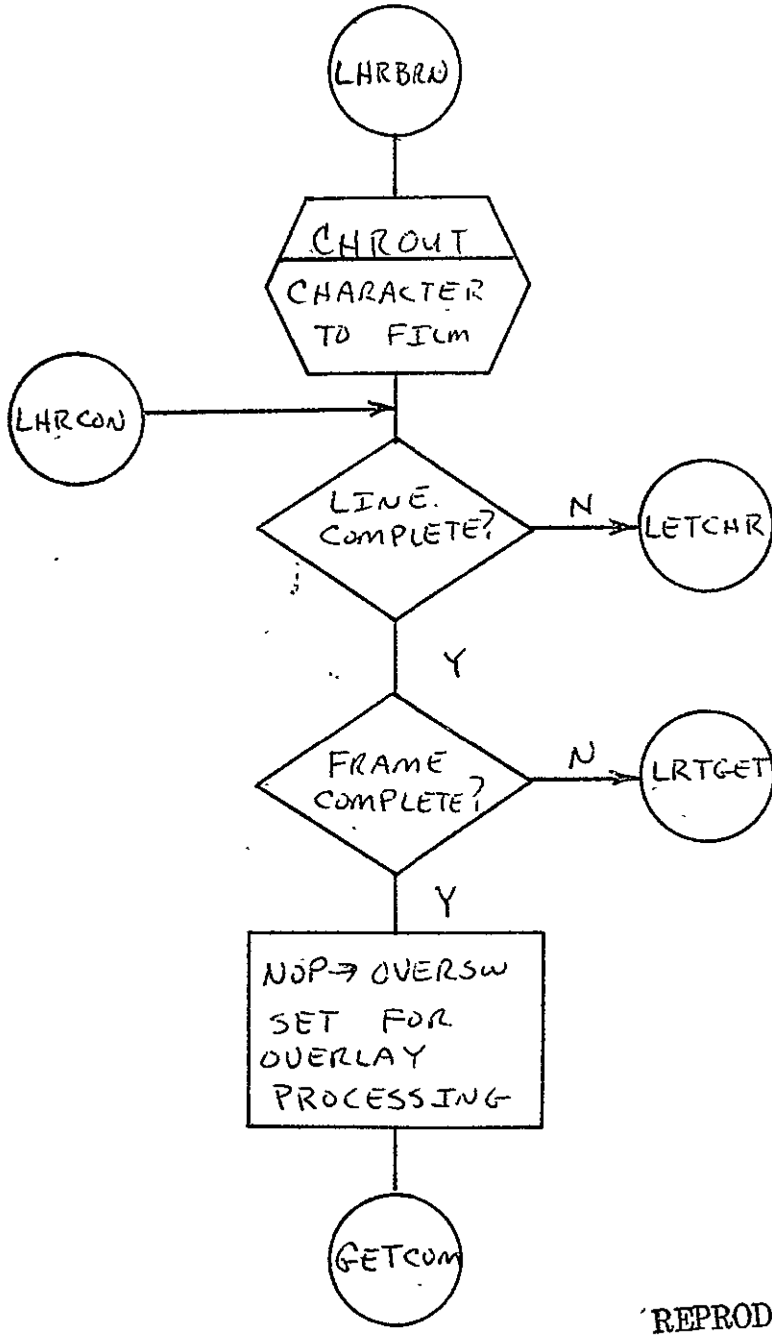

2T
SAVADD
SAVE BITCNT PARAMS. ORIG. CALL
OLDSGC—BITNum → NEWSGC
OF BITS REQ'D FROM NEW SEGMENT
BITCNT
GET NEWSGC BITS
AC → NEWSGB
BITS FROM NEW SEGMENT TO SATISFY GET MACRO
RESTOR
RESET ORIG. CALL BITCNT PARAMS
22

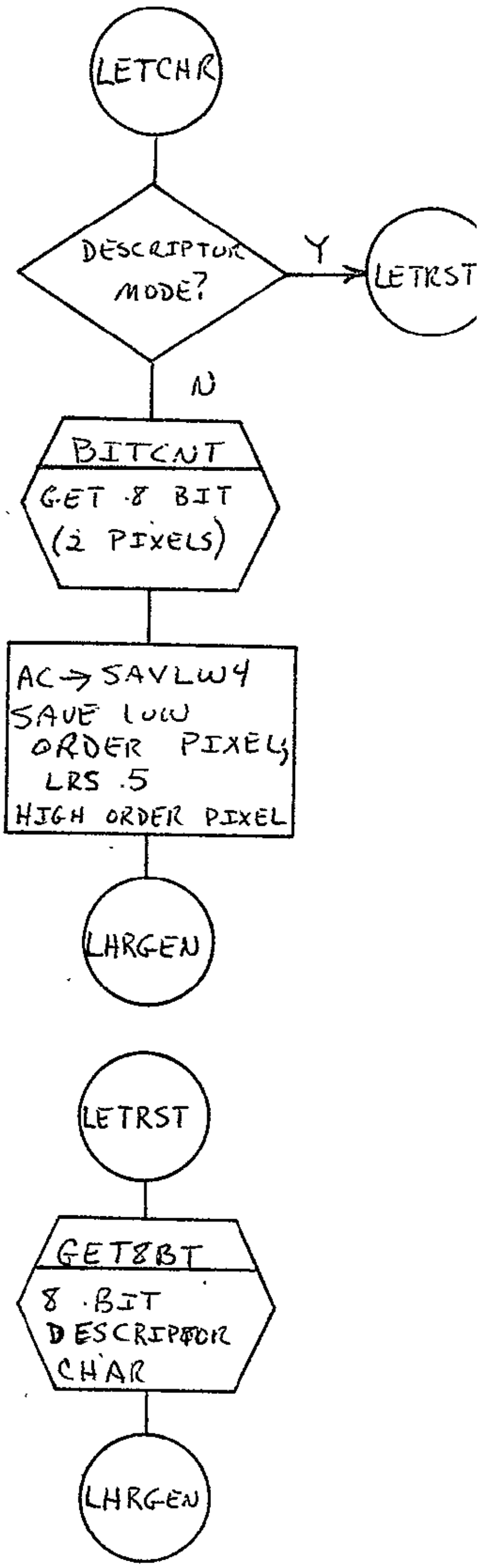

22
SHIFT BITS FROM OLDSGB AND NEWSGB → AC FOR RETURN VIA BITCNT
EXIT

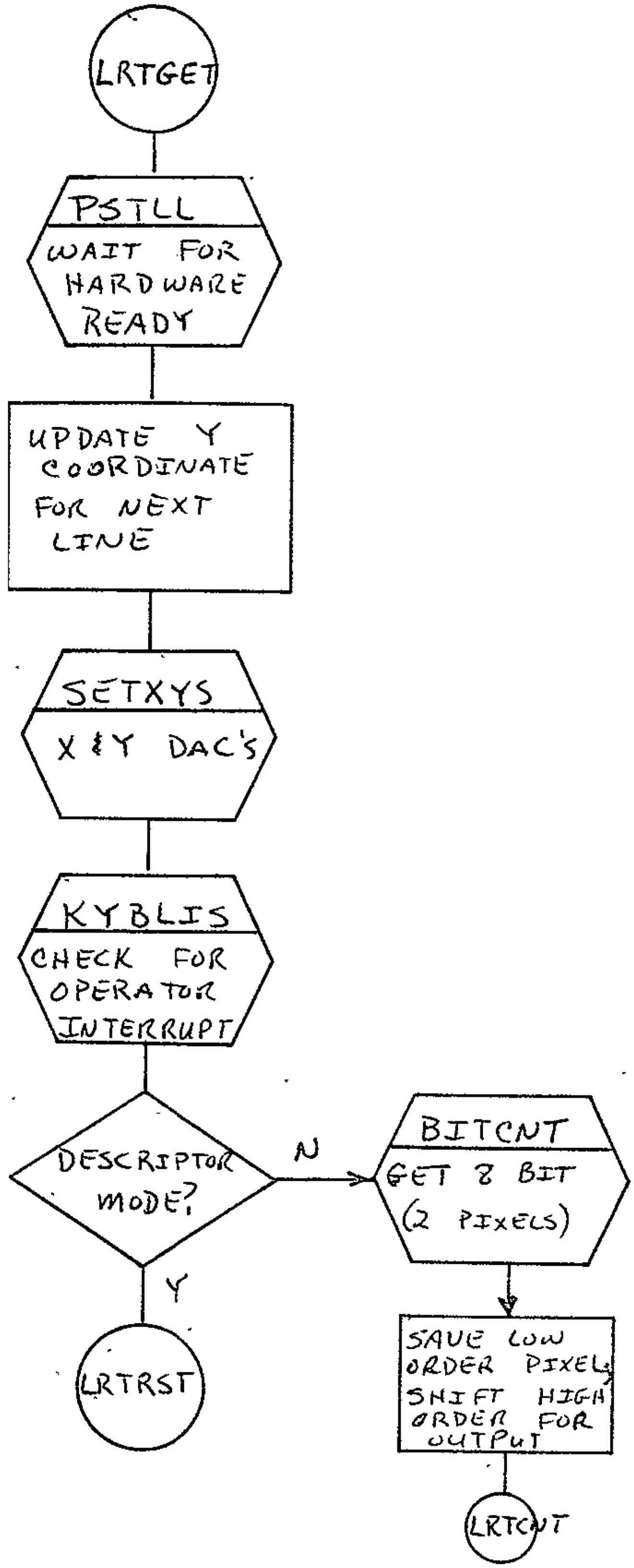

SAVADD
SAVE "GET'S" BITCNT, GETSEG, BITNUM CONTENTS FOR RETURN OF CONTROL
EXIT
RESTOR
RESTORE "GET'S" BITCNT, GETSEG, BITNUM CONTENTS FOR CONTROL RETURN TO GET
EXIT

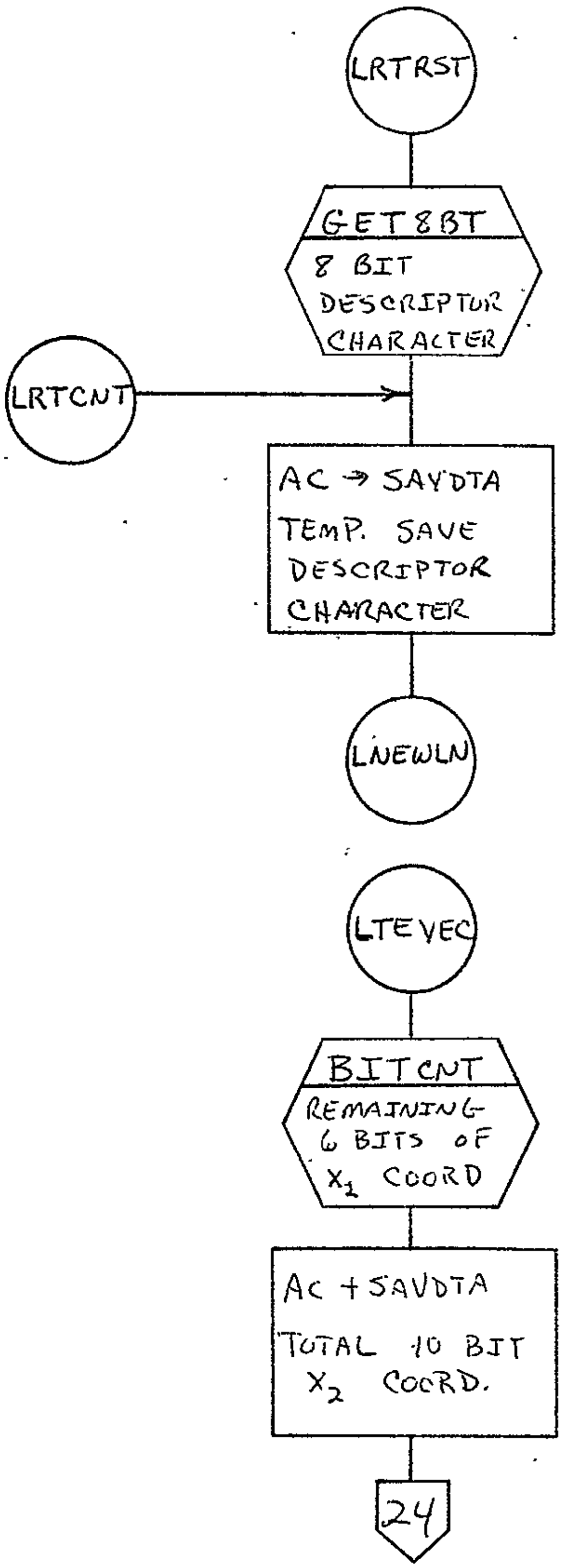

LANDTA
OVERLAY PROCESSING?
Y
OVLDTA
N
BITCNT
BIT BUCKET COMMAND + BEGIN FRAME WORDS
SAVE OFF INTENS. (8 BIT) VALUE FROM AC (2 PIXELS)
SET CHAR. SIZE, DELTA X, DELTA Y FOR LANDSCAPE PIXEL +/- CHAR
LNITCH
SETPLS
SET P.L.S. HARDWARE REGISTERS
23


23
SETXYS
X&Y DAC SETTING
MNSPOT
SET SPOT SIZE FOR LAND
LNEWLN
SET CHAR. AND LINE COUNTERS (PIXELS + SCANS)
LHRGEN
DESCRIPTOR MODE?
Y
LHRBRN
N
PNTOUT
PIXEL → FILM 1st 4 BIT OF 8 BIT BYTE
LAST PIXEL OF LINE?
N
PNTOUT
PIXEL → FILM
Y
LHRCON

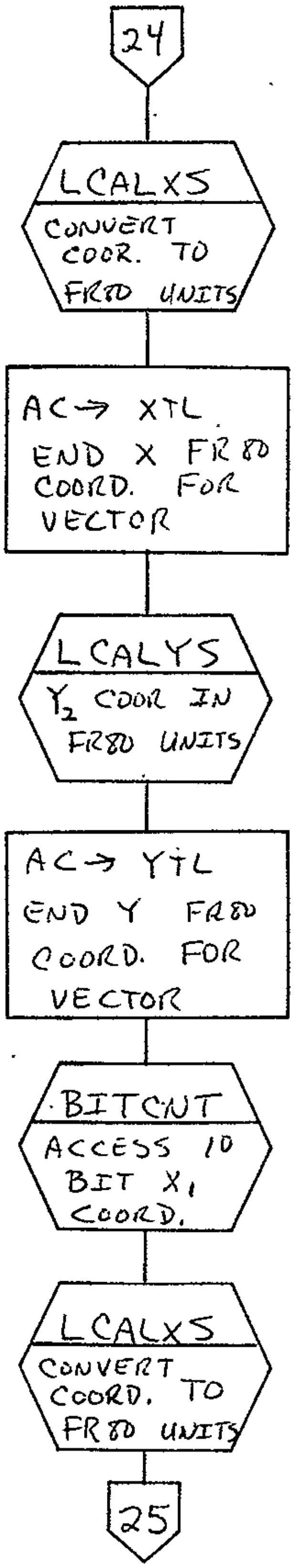

LHRBRW
CHROUT
CHARACTER TO FILM
LHRCON
LINE COMPLETE?
N
LETCHR
Y
FRAME COMPLETE?
N
LRTGET
Y
NOP → OVERSW SET FOR OVERLAY PROCESSING
GETCOM

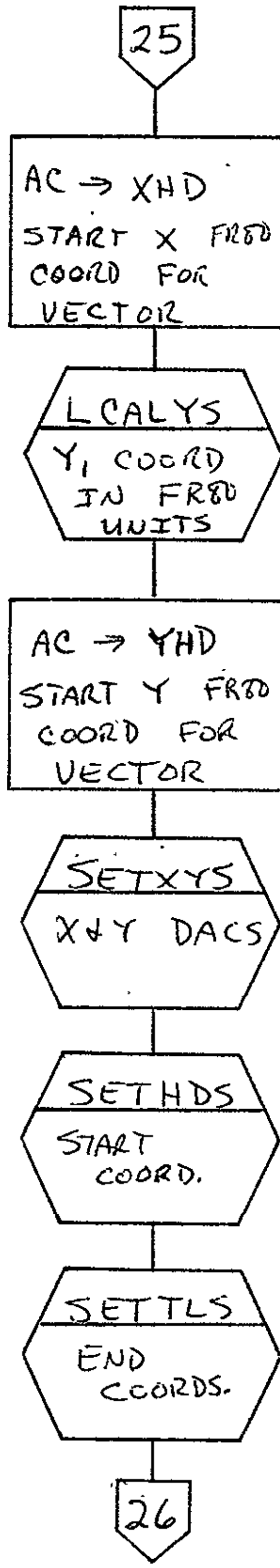

LETCHR
DESCRIPTOR MODE?
Y
LETRST
N
BITCNT
GET 8 BIT (2 PIXELS)
AC → SAVLW4
SAVE LOW ORDER PIXEL;
LRS 5
HIGH ORDER PIXEL
LHRGEN
LETRST
GET8BT
8 BIT DESCRIPTOR CHAR
LHRGEN

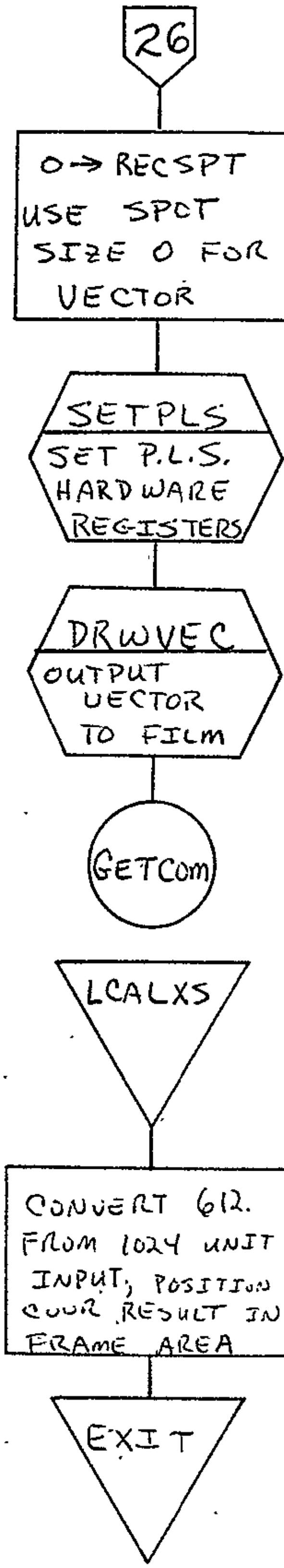

LRTGET
PSTLL
WAIT FOR HARDWARE READY
UPDATE Y COORDINATE FOR NEXT LINE
SETXYS
X & Y DAC's
KYBLIS
CHECK FOR OPERATOR INTERRUPT
DESCRIPTOR MODE?
N
Y
BITCNT
GET 8 BIT (2 PIXELS)
SAVE LOW ORDER PIXEL, SHIFT HIGH ORDER FOR OUTPUT
LRTRST
LRTCNT

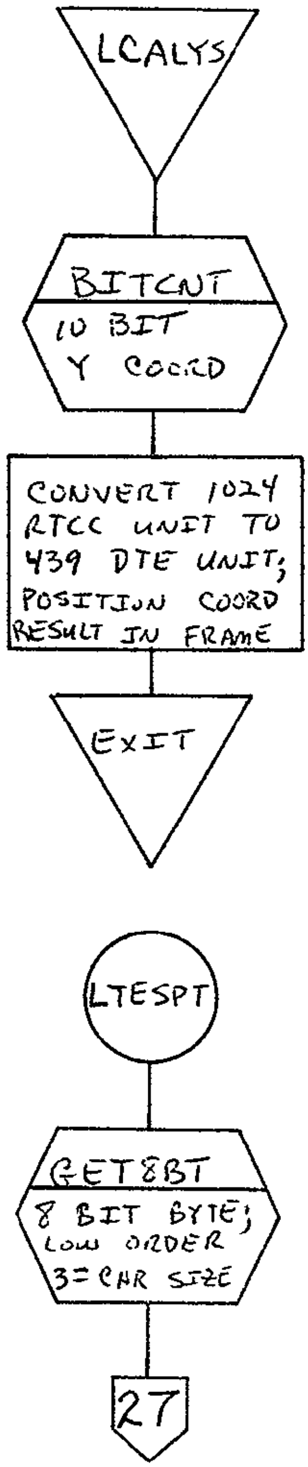


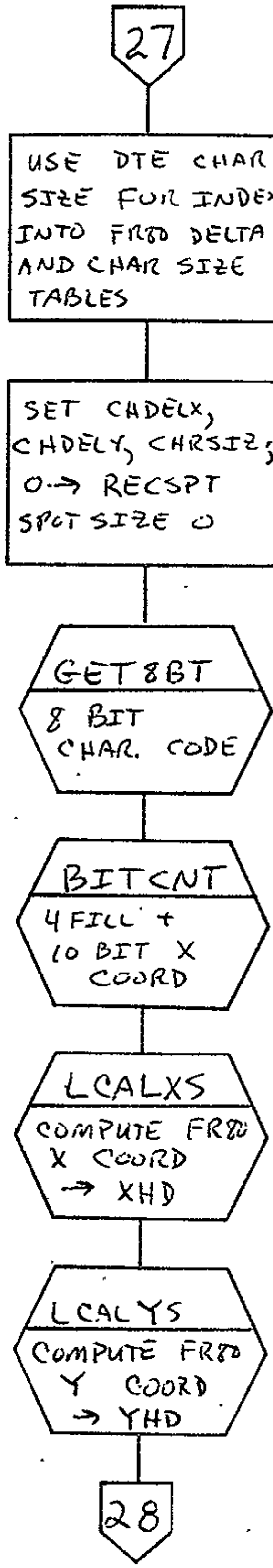
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

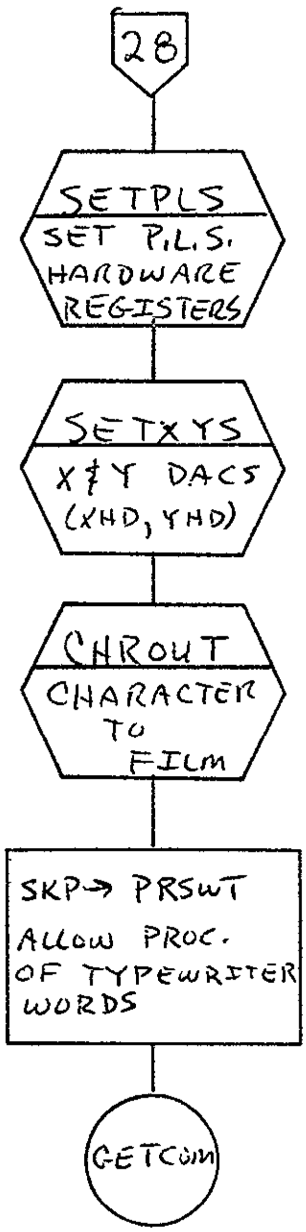

24
LCALXS
CONVERT COOR. TO FR80 UNITS
AC→ XTL
END X FR80 COORD. FOR VECTOR
LCALYS
Y_2 COOR IN FR80 UNITS
AC→ YTL
END Y FR80 COORD. FOR VECTOR
BITCNT
ACCESS 10 BIT X_1 COORD.
LCALXS
CONVERT COORD. TO FR80 UNITS
25

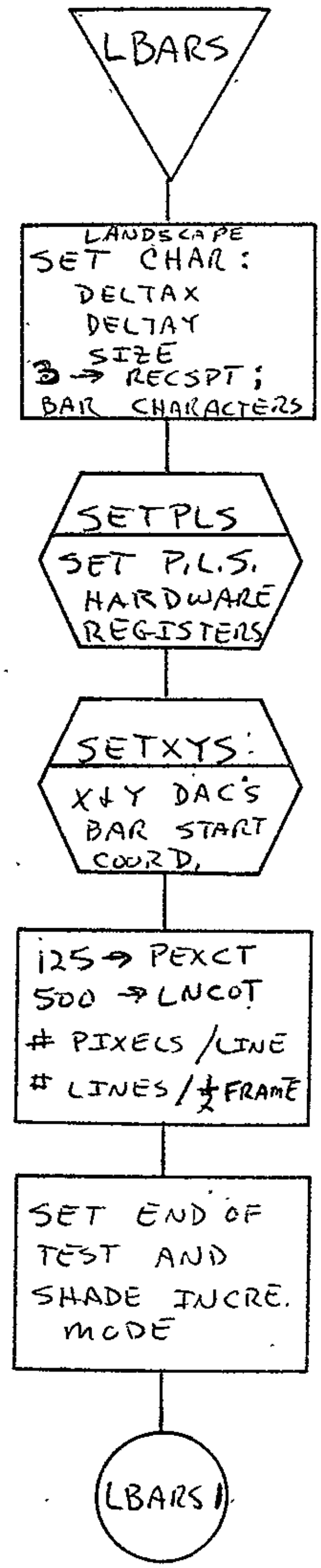

25
AC → XHD
START X FR80
COORD FOR
VECTOR
LCALYS
Y1 COORD
IN FR80
UNITS
AC → YHD
START Y FR80
COORD FOR
VECTOR
SETXYS
X & Y DACS
SETHDS
START
COORD.
SETTLS
END
COORDS.
26


26
0 → RECSPT
USE SPOT SIZE 0 FOR VECTOR
SETPLS
SET P.L.S. HARDWARE REGISTERS
DRWVEC
OUTPUT VECTOR TO FILM
GETCOM
LCALXS
CONVERT 612. FROM 1024 UNIT INPUT, POSITION COOR RESULT IN FRAME AREA
EXIT

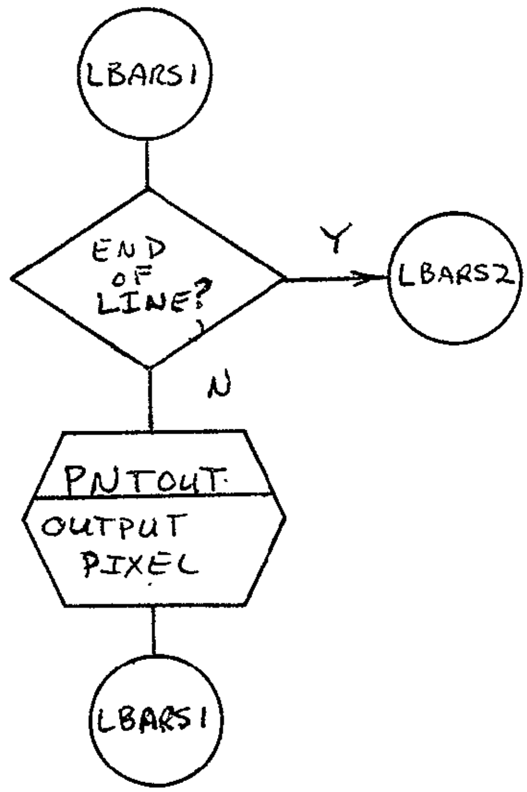

LCALYS
BITCNT
10 BIT
Y COORD
CONVERT 1024
RTCC UNIT TO
439 DTE UNIT;
POSITION COORD
RESULT IN FRAME
EXIT
LTESPT
GET8BT
8 BIT BYTE;
LOW ORDER
3=CHR SIZE
27

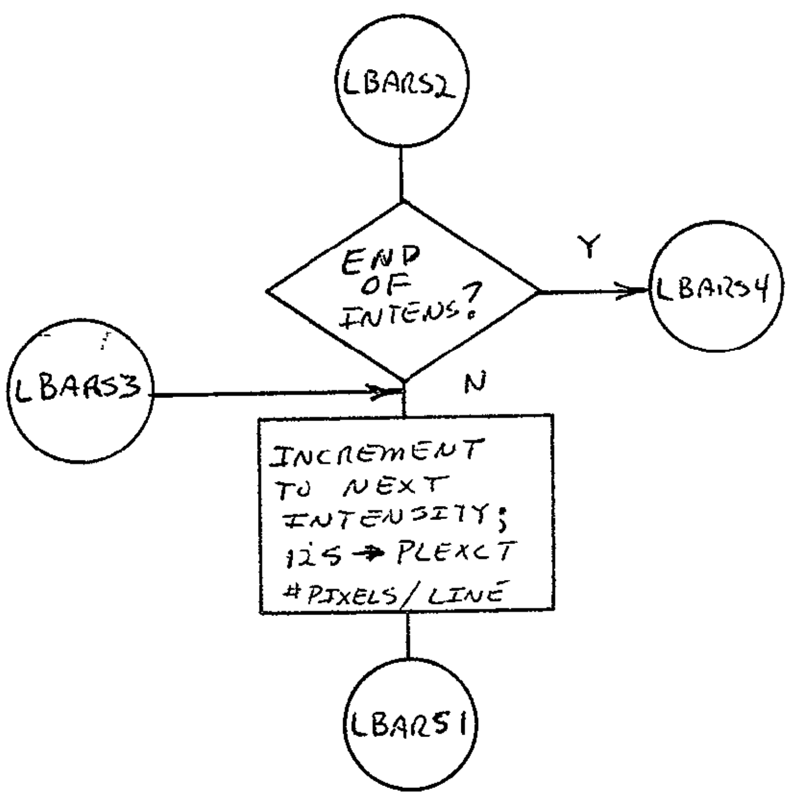

27
USE DTE CHAR SIZE FOR INDEX INTO FR80 DELTA AND CHAR SIZE TABLES
SET CHDELX, CHDELY, CHRSIZ; 0→ RECSPT SPOT SIZE 0
GET8BT
8 BIT CHAR. CODE
BITCNT
4 FILL + 10 BIT X COORD
LCALXS
COMPUTE FR80 X COORD → XHD
LCALYS
COMPUTE FR80 Y COORD → YHD
28

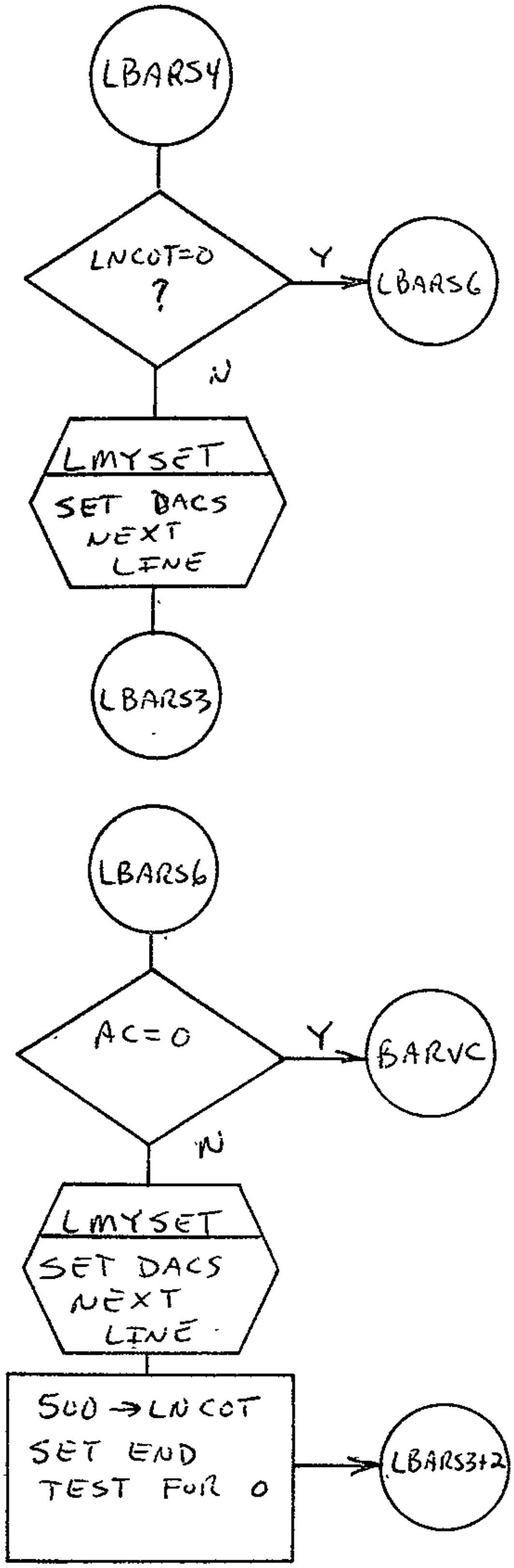

28
SETPLS
SET P.L.S. HARDWARE REGISTERS
SETXYS
X & Y DACS (XHD, YHD)
CHROUT
CHARACTER TO FILM
SKP→ PRSWT
ALLOW PROC. OF TYPEWRITER WORDS
GETCOM

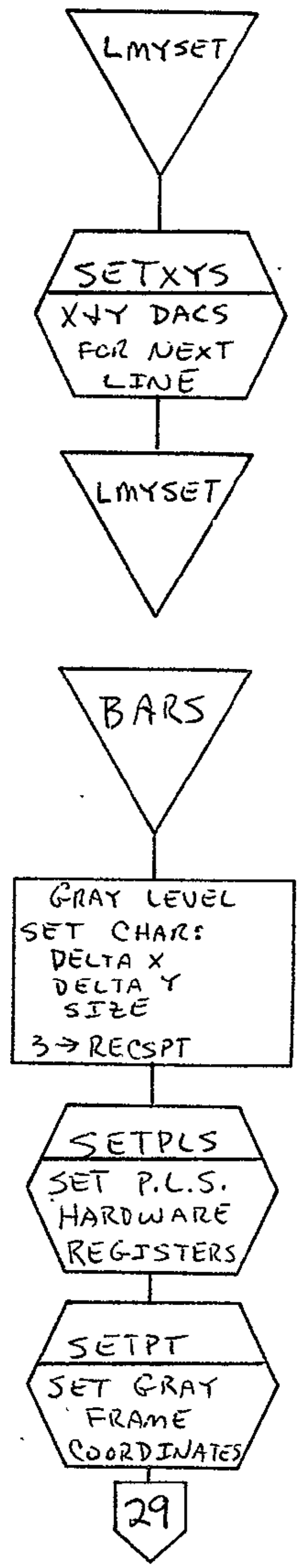


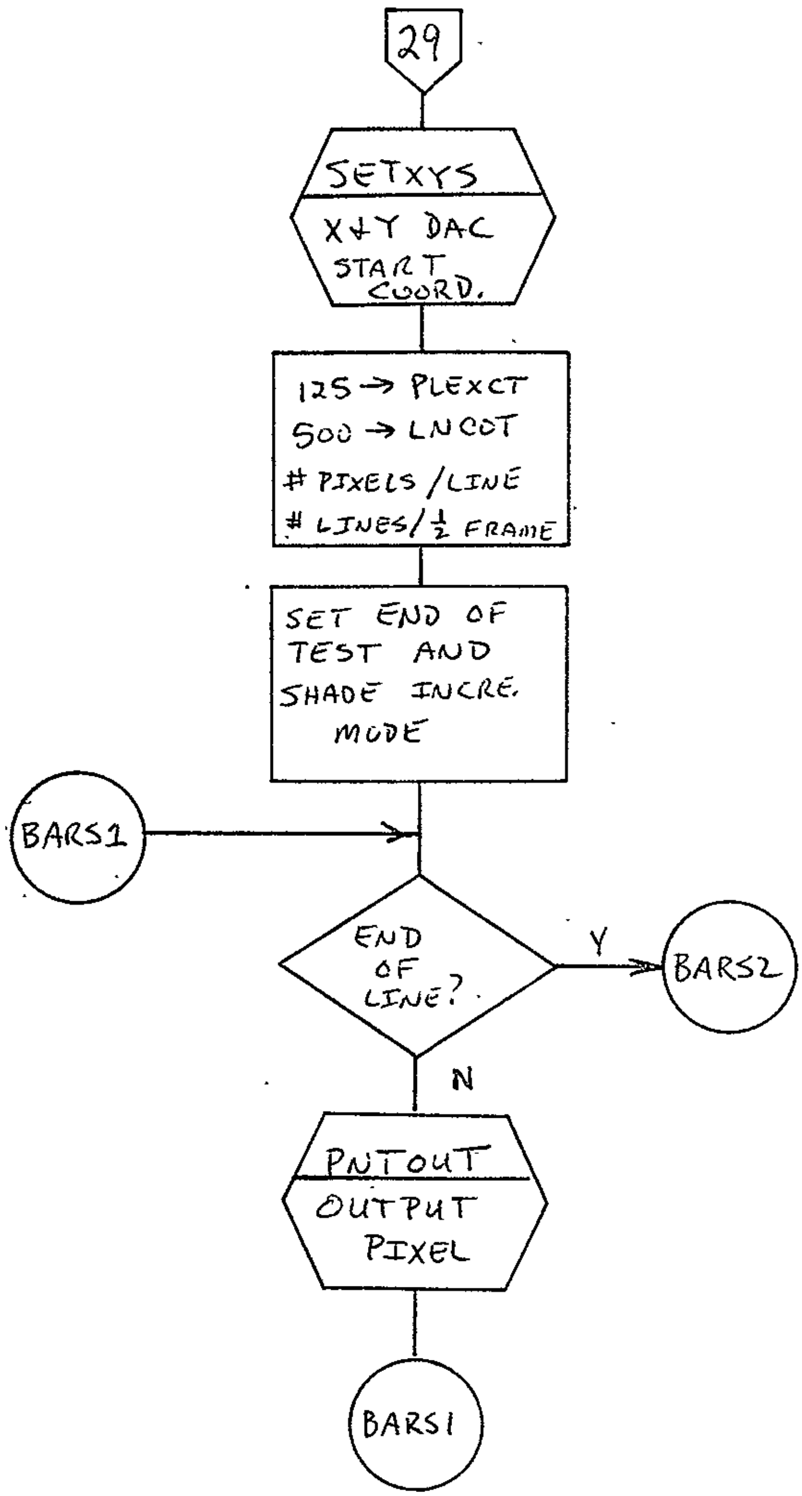
REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR

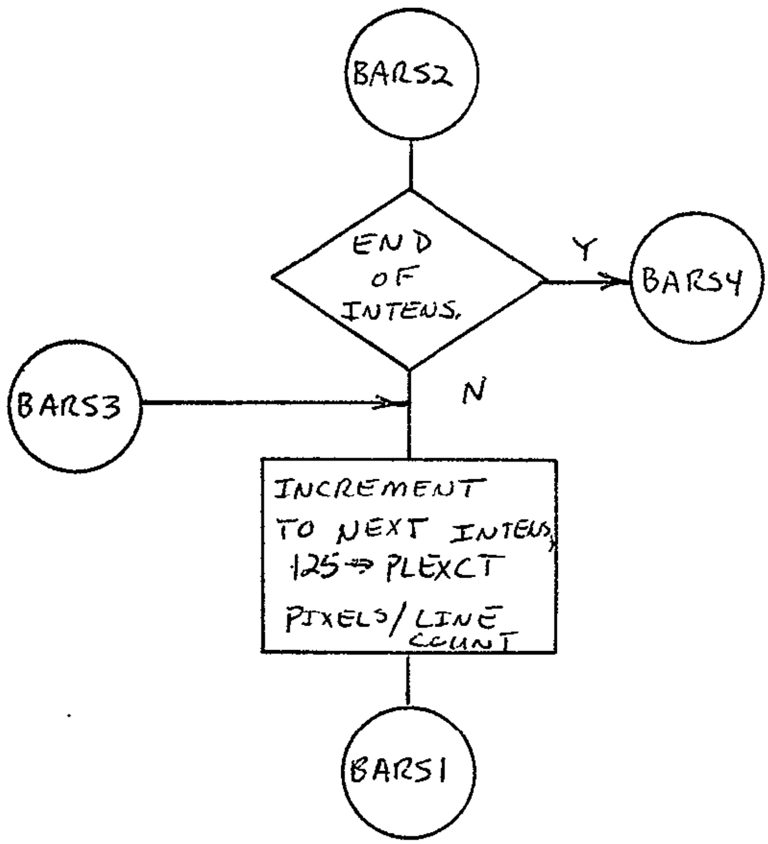

LBARS1
END OF LINE?
Y
LBARS2
N
PNTOUT
OUTPUT PIXEL
LBARS1

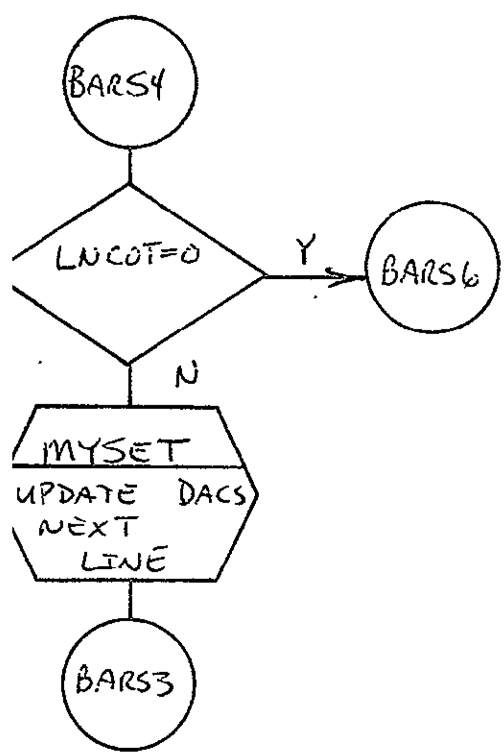

LBARS2
END OF INTENS?
Y
LBARS4
LBARS3
N
INCREMENT TO NEXT INTENSITY;
125 → PLEXCT
#PIXELS/LINE
LBARS1

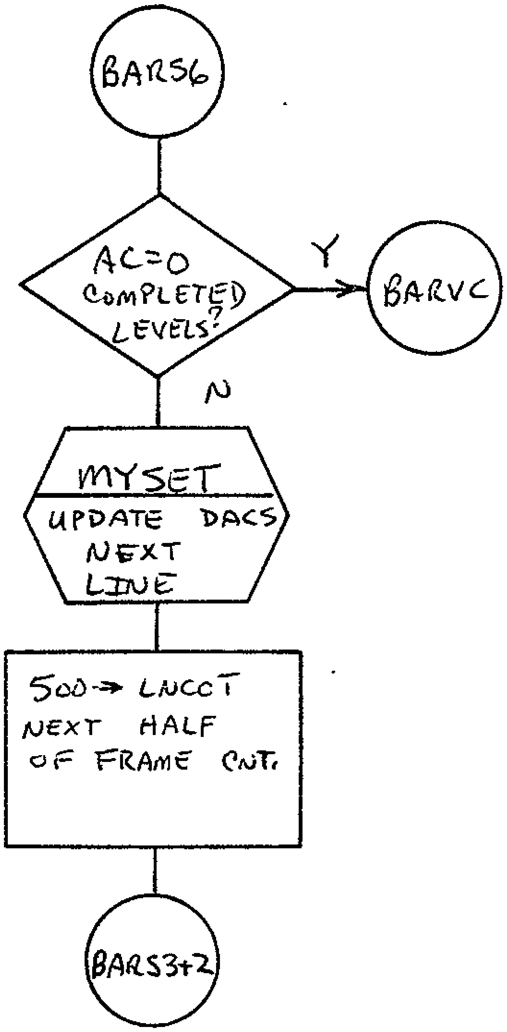

LBARS4
LNCOT=0
?
Y
LBARS6
N
LMYSET
SET DACS
NEXT
LINE
LBARS3
LBARS6
AC=0
Y
BARVC
N
LMYSET
SET DACS
NEXT
LINE
500 → LNCOT
SET END
TEST FOR 0
LBARS3+2

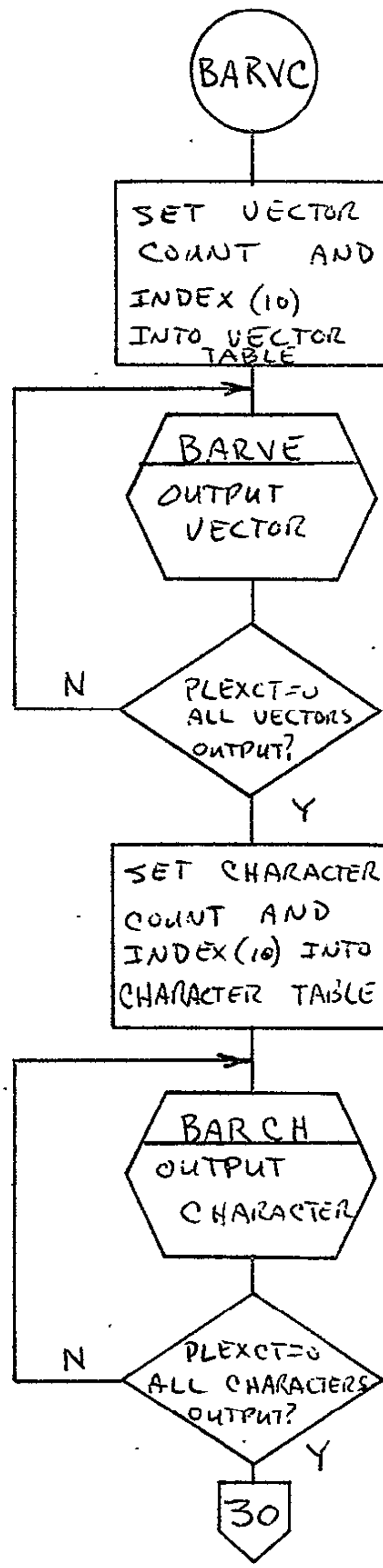

LMYSET
SETXYS
X+Y DACS
FOR NEXT
LINE
LMYSET
BARS
GRAY LEVEL
SET CHAR:
DELTA X
DELTA Y
SIZE
3 → RECSPT
SETPLS
SET P.L.S.
HARDWARE
REGISTERS
SETPT
SET GRAY
FRAME
COORDINATES
29

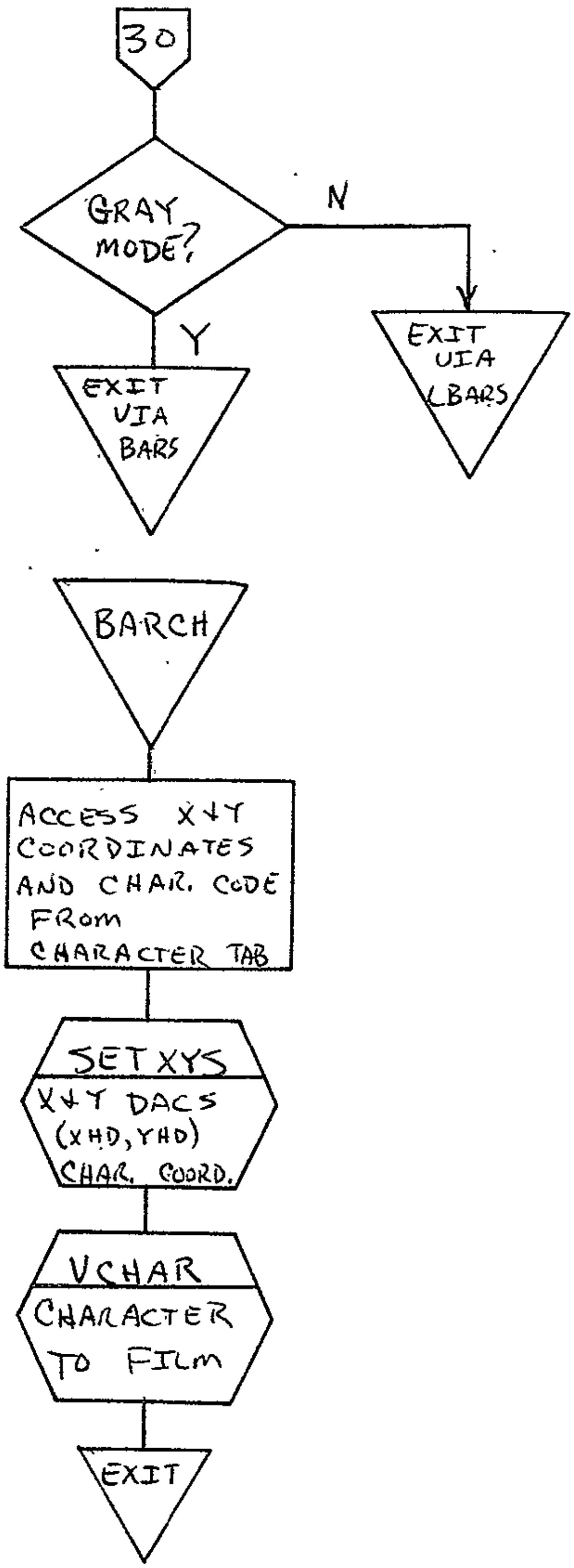

29
SETXYS
X+Y DAC
START COORD.
125 → PLEXCT
500 → LNCOT
PIXELS/LINE
LINES/½ FRAME
SET END OF TEST AND SHADE INCRE. MODE
BARS1
END OF LINE?
Y
BARS2
N
PNTOUT
OUTPUT PIXEL
BARS1

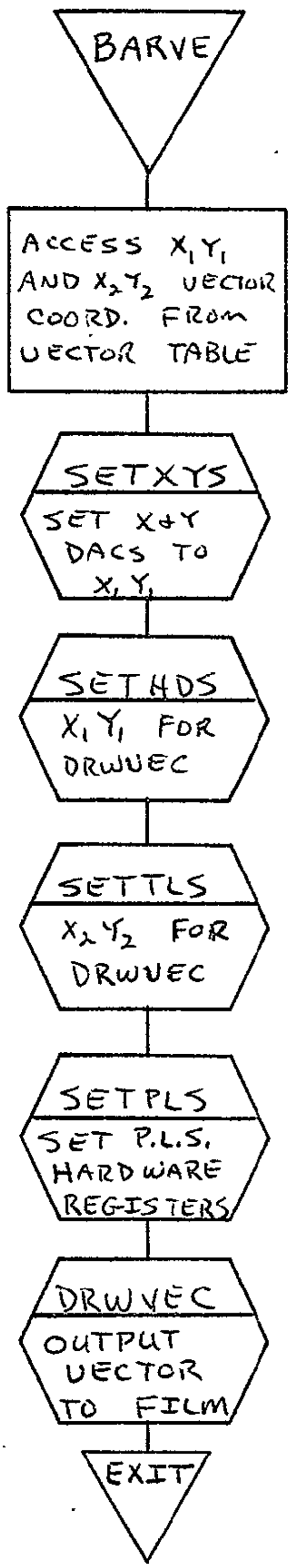

BARS2
END OF INTENS.
Y
BARS4
BARS3
N
INCREMENT TO NEXT INTENS,
125 ⇒ PLEXCT
PIXELS/LINE COUNT
BARS1


BARS4
LNCOT=0
Y
BARS6
N
MYSET
UPDATE DACS NEXT LINE
BARS3


BARS6
AC=0
COMPLETED
LEVELS?
Y
BARVC
N
MYSET
UPDATE DACS
NEXT
LINE
500→ LNCCT
NEXT HALF
OF FRAME CNT.
BARS3+2


BARVC
SET VECTOR COUNT AND INDEX (10) INTO VECTOR TABLE
BARVE
OUTPUT VECTOR
PLEXCT=0 ALL VECTORS OUTPUT?
N
Y
SET CHARACTER COUNT AND INDEX (10) INTO CHARACTER TABLE
BARCH
OUTPUT CHARACTER
PLEXCT=0 ALL CHARACTERS OUTPUT?
N
Y
30


30
GRAY MODE?
N
Y
EXIT VIA BARS
EXIT VIA LBARS
BARCH
ACCESS X+Y COORDINATES AND CHAR. CODE FROM CHARACTER TAB
SETXYS
X+Y DACS (XHD,YHD) CHAR. COORD.
VCHAR
CHARACTER TO FILM
EXIT


BARVE
ACCESS X1Y1 AND X2Y2 VECTOR COORD. FROM VECTOR TABLE
SETXYS
SET X&Y DACS TO X1Y1
SETHDS
X1Y1 FOR DRWVEC
SETTLS
X2Y2 FOR DRWVEC
SETPLS
SET P.L.S. HARDWARE REGISTERS
DRWVEC
OUTPUT VECTOR TO FILM
EXIT

2.3 COMA VARIAN 73 PRINT PROCESSOR FOR 16 mm FILM (VAR16)

2.3.1 Background

A. Author. B. Miller, Aeronutronic Ford Corporation.

B. Intent. The requirements for this program are specified in SH-25752.

C. Program History

1. Production Tape Date. 15 November 1974
2. Author. B. Miller
3. Authorization. Clarification form A15 and SH-25752
4. Test Case. TPS (JSC Form 1225) No. A4.
5. Reference. Appendix B, paragraph B.3

2.3.2 Introduction

2.3.2.1 Hardware Requirements

- FR80 with 12K memory
- 7- and 9-track tape units
- 16 mm camera

2.3.2.2 Software Requirements

VAR16	III161	III164
III109	III161 GO	III164 FILM
III166	III147	III185
III166 INVAR	III162	III187
III166 ADVAN	III162 MACRO	NULL
III166 TABLE	III163	FORM1 thru FORM4

2.3.2.3 Assembly Parameters

A. ALLOW. Allows code for forms loading and flashing to be assembled.

B. ASCII. Causes the 7-bit ASCII table to be assembled as VCHTAB.

C. BATCH. Allows code for batch processing to be assembled.

D. BIGBUF. If 0, allows the MONITOR to be assembled with a maximum number of features.

E. CAMNUM. If 2, camera parameters for the 16 mm unsprockete camera are assembled.

F. FONT. If 0, allows assembly of the character font FILM.

G. FTYPE. If 16, indicates 16 mm film.

H. MTMANY. If 0, code for using only one drive will be assembled in the tape routines.

I. MTPTR. If 10, tape read routines will use auto-index register 10 as MTPTR.

J. MTSIZE. Size of the teletype buffer.

K. MUMBLE. If 1, allows assembler to output program configuration during assembly.

L. NUMCAM. If 6, camera used may be changed at run time.

M. PTYPE. If 3, indicates forms are assembled for EBC.

N. TWOBUF. Allows code for double-buffered tape reads to be assembled.

O. 7TRACK. If 1, allows code for 7-track read to be assembled.

P. <u>9TRACK</u>. If 1, allows code for 9-track read to be assembled.

2.3.2.4 Operator Commands

```
*
*TIME=15:48'3.8"
*FRAME=0
*CURRENT PAGE=0
*GO
*CONTINUE
*MAKE FILM=1
*CLEAR
*ADVANCE
*TAPE TYPE - 2,5,8 OR 9=9
*BACK
*PARITY=1
*USE=1
*REWIND
*SKIP
*TRY AGAIN=10
*FORM=   NUL16    FORM1    FORM2    FORM3    FORM4
*OVERALL FORM=NO
*ERROR FORM=NO
*HITS-CHARS,VEC,PTS=1,1,1
*FOCUS
*CAMERA=2
*PULLDOWN=5
*LOAD=VAR16
*ROTATION=0
*CARRIAGE CONTROLS=2
     1=NONE,2=VORTEX,3=TERMINAL
*LINES PER PAGE=60
```

2.3.3 Analysis

2.3.3.1 Major Control Section

A. Description. Prior to beginning processing of a tape, the operator has the capability to enter the type of carriage controls and the number of lines per page via MONITOR. The default values are VORTEX carriage controls and 60 lines per page.

After MONITOR receives the GO command, the program sets the location and length of the buffers (NEXBUF and CURBUF) to be used for the doubled-buffered tape read. MTRINI is then called to initialize all pointers for the double-buffered read and to read the first two records into the corresponding buffers. CTRLCK will continue reading the tape and processing control records until the first data record is encountered.

If no job separator record was found (S.FLAG = NOP), JOBTLE requests tape identification information (five characters) from the operator. Then JOBID outputs either the information in the job separator or the information from the operator in eyeball-sized letters. Prior to beginning outputting data, HEADER sets the PLS hardware for printing and TOPPAG sets the coordinates for the beginning of a page. VCHTAB, the table of 8- and 7-bit ASCII character code pointers, is loaded as the base address. Bit 0 is set when the base address is loaded so that the character generator will be in the eight-bit/byte mode.

Then the program enters the main print loop. Here, processing branches to one of three different sequences depending on whether the carriage control is NONE, VORTEX, or TERMINAL.

For processing with NONE carriage controls, the routine CTRLCK reads the next record and checks to see if it is a control record. If so, it is appropriately processed, and the next record is read and checked, and this sequence continues until the print data is accessed. NEXTLN is then called to do a carriage return and line feed (or new page when the current page is full). The number of bytes in the record (MTCNT times 2) is loaded as the character count, and MTPTR, which contains the address of the current tape buffer, is loaded as the starting address. Then the character generator is started. After the line is plotted, the program returns to the beginning of the print loop where CTRLCK is called to read and check the next record.

When processing with VORTEX carriage controls, the routine CTRLCK performs the same function as above until a print record is accessed. GTCTRL then checks the first byte of this record and executes the carriage control. MTCNT times 2 plus 1 (to compensate for the carriage control byte) is loaded as the count for the character generator. The starting address has bit 0 set so that the character generator will start with the right-most byte of the first word. The character generator is then started. After the line is plotted, the program returns to the beginning of the print loop where CTRLCK is called.

Processing with TERMINAL carriage controls requires that each byte be checked, since a carriage control may be any byte(s) in the record. CTRLCK performs the same functions as above until a print record is accessed. SAVCNT (MTCNT times 2) is loaded and the character count and the contents of MTPTR is loaded as the starting address. The program then branches to GTINIT where MTCNT and MTPTR are initialized for GTBYTE. At GTNGO, GTBYTE is called to retrieve a byte from the current tape buffer. If the byte is not a carriage control, it is plotted on film. Then the 2's complement of the characters/record count (SAVCNT) is incremented. If the count is not exhausted, the program returns to GTNGO to get and process the next byte. When SAVCNT is exhausted, MTCNT is changed to a LAM so that the next record will be read. Then the program returns to the beginning of the print loop.

Terminal carriage control bytes are 214 (or 14), 212 (or 12), and 215 (or 15). If the byte retrieved at GTNGO is a 215 (or 15) the program branches to SAMLIN. A 214 (or 14) results in jumping to NXTPG and a 212 (or 12) causes the program to go to NXTLN.

At SAMLIN, THISLN is called to set up for the overprint. The program then returns to the instruction where SAVCNT is incremented. At NXTPG, NXPAGE is called. Then the program returns to the instruction where SAVCNT is incremented. At NXTLN, the routine NEXTLN executes the carriage return/line feed (or goes to a new page when necessary). The program then returns to where SAVCNT is incremented.

When an end-of-file is encountered, CUTMAK is called to output cutmarks on the current frame and NEXPAG flashes the forms (if any) on this final frame. Then JBSPCE spaces down 10 frames in order to separate the jobs on the tape. If this file is the last one in this batch to be processed, S.FLAG is initialized to a NOP. If no job separator was encountered, the file number in the JOBNAM buffer is updated. The file number (FILNUM) is incremented and the record counter (RECNUM) and form number (FRMNUM) are initialized to zero. Then the next file is processed. Upon finding a second end-of-file, S.FLAG and JOBTLE are reinitialized for processing a different tape.

B. Input/Output

1. Input. Input is a 7- or 9-track Varian 73 print tape.

2. Output. Output is to 16 mm film.

C. Linkages

1. External Routines

CUTMAK	KYBLIS	MTLAC	ROTTST
FLASH	MCRLF	MTRINI	SETPLS
FRSPIC	MDOUT	NEXPIC	
GETNUM	MMESSG	PSTLL	

2. Internal Routines

BMSTLL	DFCTRL	GTCTRL	LDINFO	NEXTLN	PPAGE
CRGCTL	FRFLAS	HEADER	LINES	NXPAG	THISLN
CTRLCK	GTBYTE	JOBTLE	NEXPAG	PFLASH	TOPPAG

3.3.2 Subroutines

A. JOBTLE. Called if no job separator record is encountered before the print data is accessed. The message ENTER TAPE

NUMBER: is output at the teletype via MMESSG. Then the input characters (five entries) are read and printed at the teletype. If a RUBOUT (ASCII 377) is encountered, the routine branches back to its beginning; otherwise, the entries are stored in the buffer JOBNAM as the instruction "LAC VCHTAB + (octal value of entry)." The sixth entry of JOBNAM is the current file number in ASCII configuration.

B. GTBYTE. Unpacks the 16 least significant bits of a word into two eight-bit bytes. The left-most byte is returned in the accumulator on the first call and the right-most byte is returned on the second call, etc. MTPTR points to the word to be unpacked.

C. HEADER. Loads the appropriate X delta, Y delta, spot size, character size, and intensity registers, and then sets the optical hardware via SETPLS.

D. NEXPAG. Finishes the current page by flashing the forms (if any) via PPAGE and FRFLAS, advancing to the next frame by calling NEXPIC, and initializing for the next page with routine TOPPAG.

E. TOPPAG. Resets the line count (LNCNT) and resets the X and Y DAC's to the beginning position for a page.

F. FRFLAS. Flashes the overall form if one has been loaded.

G. PPAGE. Flashes the error form when the error flag (ERFLAG) has been set if one has been loaded. Other forms (if loaded) will be flashed if FLASSW is set to a NOP.

H. THISLN. Is called when the carriage control is to overprint the next line. The X DAC is repositioned to the beginning of the current line, and BMSTLL allows the DAC's to settle before returning to the main loop.

I. NEXTLN. Called when the carriage control is a single space. The page line number (LNCNT) is incremented and checked to see if it is zero. If so, the page is full and the routine branches to NUPAGE where NXPAGE is called. If

LNCNT is not zero, CRT is executed and BMSTLL is called to allow the DAC's time to settle before processing the next line.

J. NXPAGE. Waits for all plotting to finish (PSTLL) and calls CUTMAK to output cutmarks on this frame. Then NEXPAG is called to flash forms on this frame and set up for the next one. KYBLTS then checks for teletype interrupts.

K. GTCTRL. Decodes the vortex carriage control bytes. The word from the tape buffer with the carriage control in the left-most byte should be in the accumulator prior to entering GTCTRL. The contents of the accumulator are shifted right eight bits and the six least significant bits are masked off and retained. A result of 61 causes the program to branch to NXPG, where the subroutine NXPAGE is called. If the result is 53, the program branches to SAMLIN where THISLN is called. If the carriage control is a 60, NEXTLN is called twice. Any other code results in NEXTLN being called.

L. BMSTLL. Allows a delay of 120 cycles.

M. CUTMAK. Draws three groups of five vectors in the upper left corner of the 16 mm frame.

N. JBSPCE. Spaces down 10 frames when an end-of-file is encountered.

O. CTRLCK. Calls MTLAC to read the next record and retrieve the first word from the current tape buffer. Then the 2's complement characters/line count (SAVGNT) is computed. The first byte of this record is then checked for being a 245, indicating a fiche control record. If it isn't, the program returns to the print loop where the record is output. Otherwise, the second byte is then checked. An S record is processed at SREC where bytes 15-20 are stored in JOBNAM as the tape identification. An F record is decoded at FREC to get the number for FRMNUM. T, C or B records are skipped. (If a control record is none of the above, the program assumes that it is actually a print record and then returns to the print loop.) The program then goes back to the beginning of CTRLCK, where the next record is read.

P. JOBID. Outputs the six entries in JOBNAM in eyeball-sized characters, using DRWCHR. There are three characters on each of two frames with a cutmark on each one.

2.3.3.3 Constants and Variables

A. Internal

1. SAVCNT. Contains the 2's complement number of characters to be output in the current line. This number is computed by doubling the number of words (MTCNT) in the record just read. If processing with VORTEX controls, the carriage control byte is compensated for by adding one.

2. NEXBUF. Contains the address of the buffer to be used during the next tape read.

3. TMPCT. A multi-purpose variable.

4. CURBUF. Contains the address of the current tape buffer.

5. SV. Contains the first carriage control byte of a job (when processing with VORTEX controls).

6. LNCNT. Currently contains the 2's complement of the line's per page minus the current line number.

7. TEMP. A multipurpose location.

8. VCHYI. Contains the beginning Y coordinate for a page.

9. GTSAVE. Contains the word from the tape buffer currently being unpacked by GTBYTE.

10. TNMBR. Counter used for reading teletype entries in JOBTLE.

11. NTREE. Contains the current entry from the teletype.

12. JOBNAM. Name of the buffer which contains the information input by operator as the first five entries and the file number in ASCII as the sixth.

13. TNMMSG. Name of the buffer containing the message ENTER TAPE NUMBER:.

14. ILLEGL. Name of the buffer containing the message INVALID ENTRY.

15. CCTYPE. Name of the buffer containing the message 1=NONE,2=VORTEX,3=TERMINAL, displayed on the monitor to explain the carriage control option.

16. XORWRD. If 400,000, indicates VORTEX carriage controls; otherwise, it is zero. Used to initialize the starting address for the character generator.

17. CTRL. Contains carriage control indicator (1 for NONE, 2 for VORTEX, or 3 for TERMINAL). This is operator-accessible via MONITOR.

18. LNS. Contains the maximum number of lines per page. The default value is 60. However, LNS is operator-accessible via the MONITOR.

19. ERFLAG. Indicates an error is set to a LAM. Allows error form (if one has been loaded) to be flashed on the page.

20. ERFMFL. Contains the address of the error form if this form has been loaded.

21. FRAMFL. Contains the address of the overall form if this form has been loaded.

22. FRMNUM. Contains the number of the form to be flashed (0, 1, 2, 3, or 4).

23. FRMTAB. A table of the addresses of the forms which have been loaded.

24. LENGTH. The 2's complement of the length of a single tape buffer.

25. BUFFER. Area reserved for the tape buffers.

26. XFOFF. Contains the X offset for using forms.

27. YFOFF. Y offset for using forms.

28. SPCNUM. Contains the number of scope points to be used for a character space.

29. LNFDNM. Contains the number of scope points to move during a line feed.

30. FORMSW. Indicates that a form has been loaded if it contains a SKP.

31. FLASSW. Allows the subroutine PFLASH to be called when set to a NOP. Should be set to a SKP when forms are not to be flashed.

32. FRAME. Frame counter for the JOBID routine.

33. LETTER. Letters per frame counter in the JOBID routine.

34. VCHARD. Contains the instruction for getting the appropriate character code pointer from VCHTAB before calling DRWCHR.

35. FCXP. Contains the starting X coordinate for the next eyeball-sized character to be output by DRWCHR.

36. FCYP. Contains the starting Y coordinate for the next eyeball-sized character to be output by DRWCHR.

B. External

1. MTPTR. Auto-index register 10, used for accessing words in the current tape buffer.

2. PBUFSZ. Contains the 2's complement of the length of a tape buffer.

3. VCHTAB. Table of eight- and seven-bit ASCII character code pointers.

4. MVDATA. Used as a temporary counter location.

5. LEFTX. Contains the X coordinate for the beginning of a page.

6. FILCNT. Contains the 2's complement of the number of files left to be processed in the current batch.

7. FILNUM. Contains the number of the current file.

8. RECNUM. Contains the record number of the record in CURBUF.

9. CHDELX. Contains the value to be loaded into the X delta register.

10. CHDELY. Contains the value to be loaded into the Y delta register.

11. CHRSIZ. Contains the value to be loaded into the size register by SETPLS.

12. RECPIN. Contains the value to be loaded into the brightness register by SETPLS.

13. RECSPT. Contains the value to be loaded into the spot size register by SETPLS.

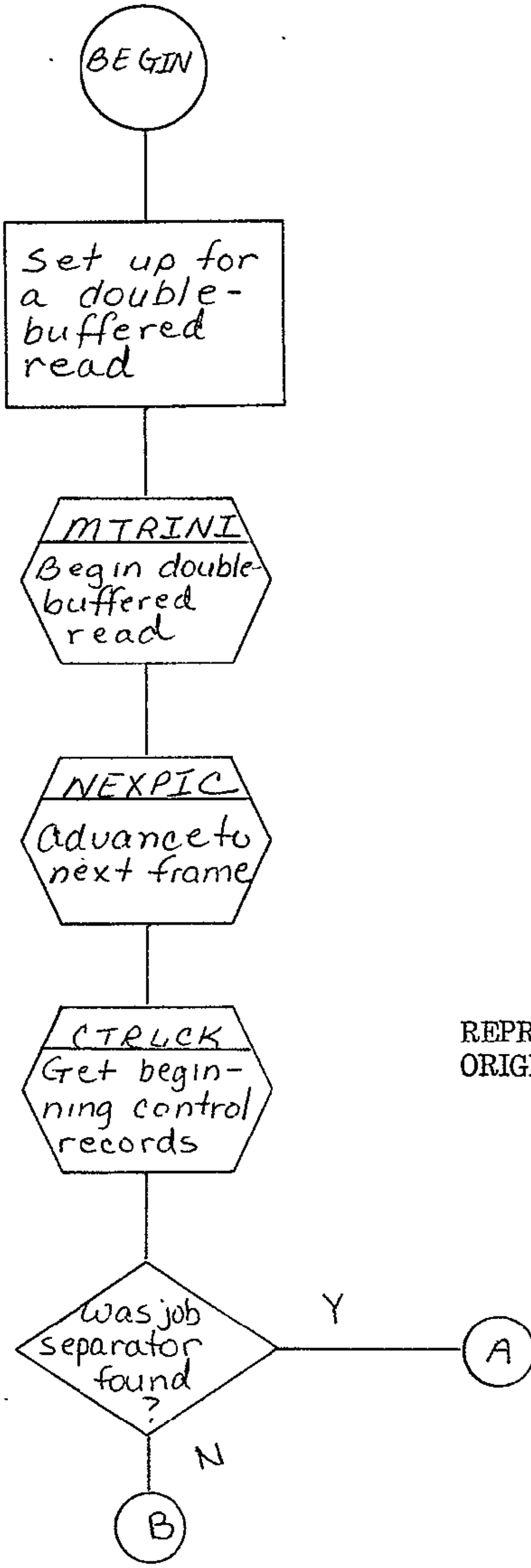
14. DECNUM. Contains the decimal configuration of the number after GETNUM is called. If no number is found by GETNUM, DECNUM contains a LAM.

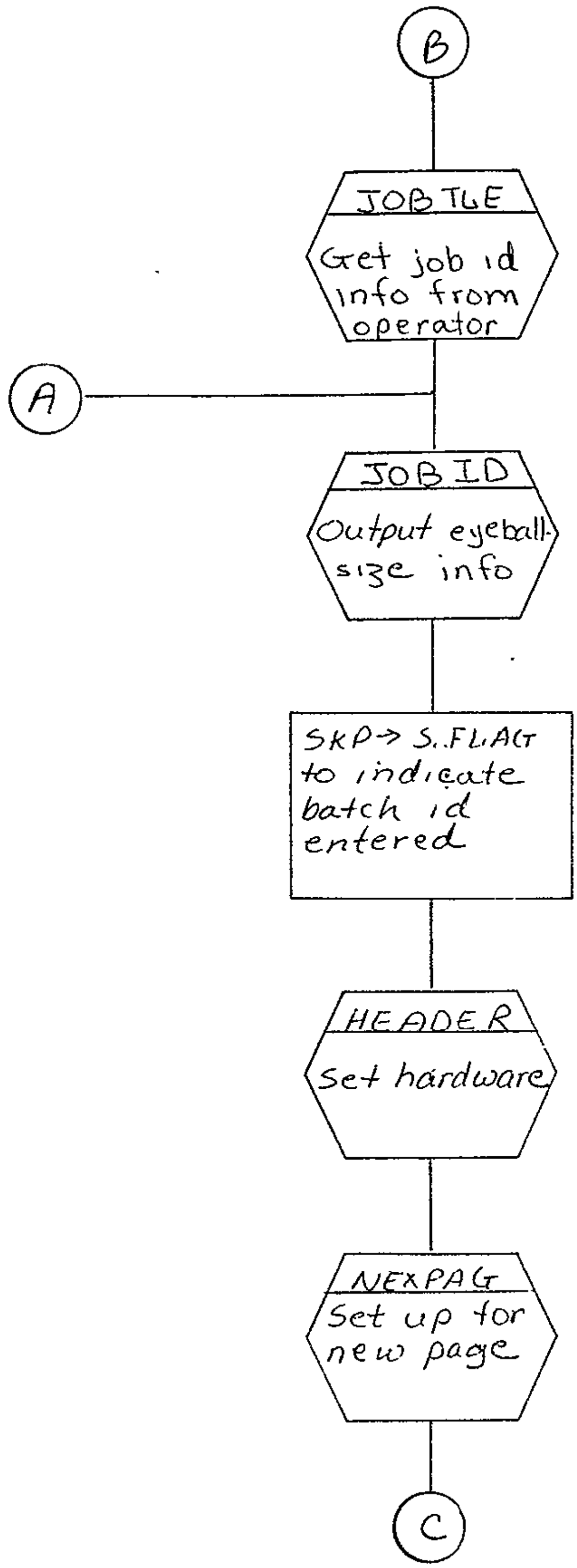
15. MTCNT. Contains the 2's complement number of words read into the tape buffer.

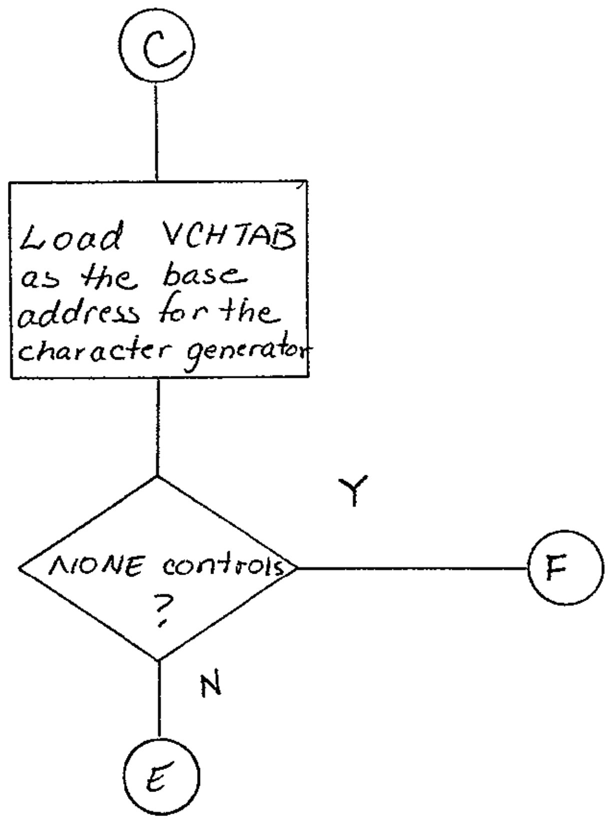
16. TOPY. Contains the beginning Y coordinate for a page.

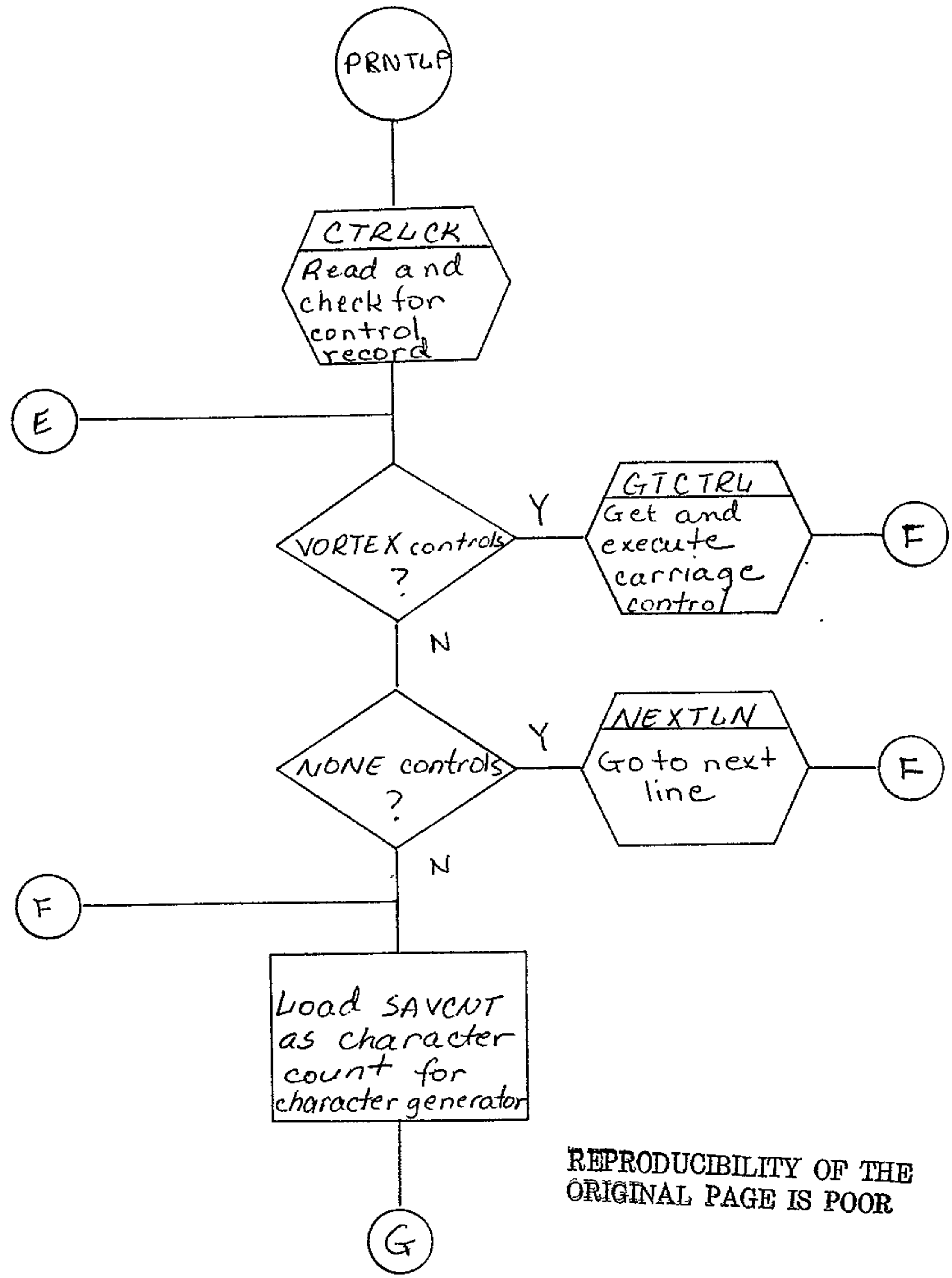
17. FRMPTR. Points to the beginning of the form to be flashed.

3.3.3.4 Flow Charts. See following pages.

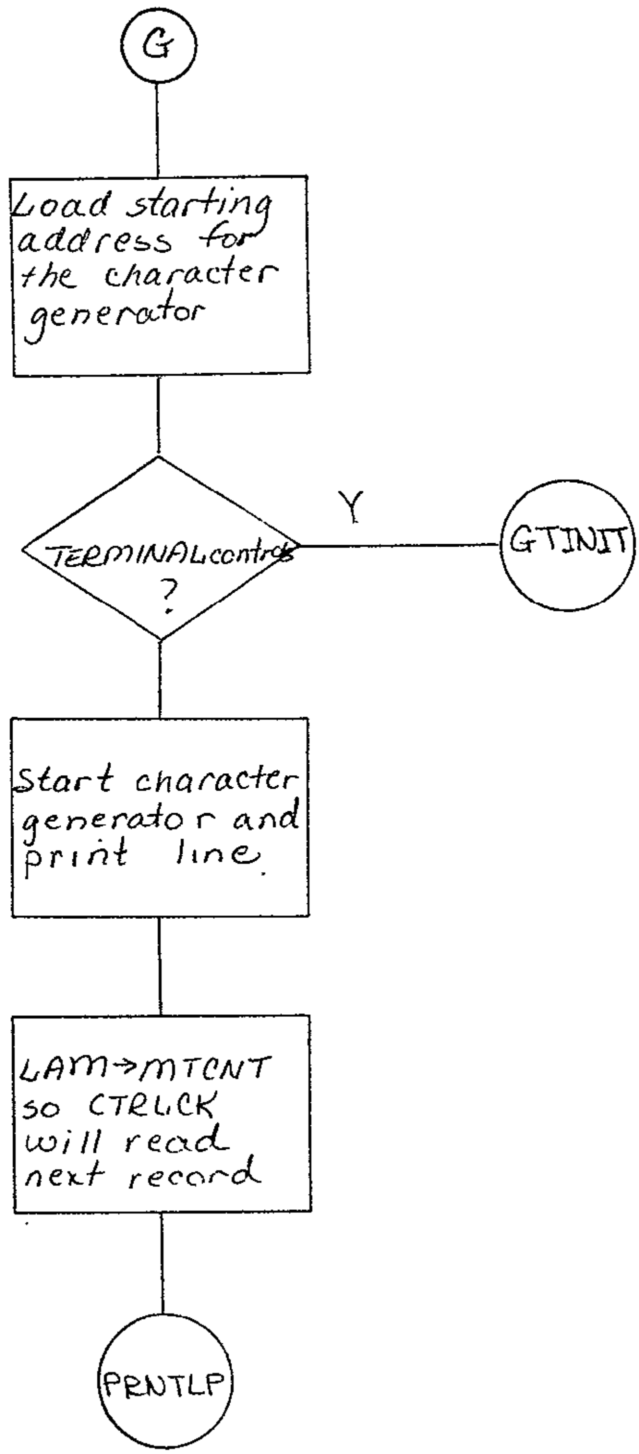

BEGIN
Set up for a double-buffered read
MTRINI
Begin double-buffered read
NEXPIC
Advance to next frame
CTRLCK
Get beginning control records
Was job separator found ?
Y
A
N
B

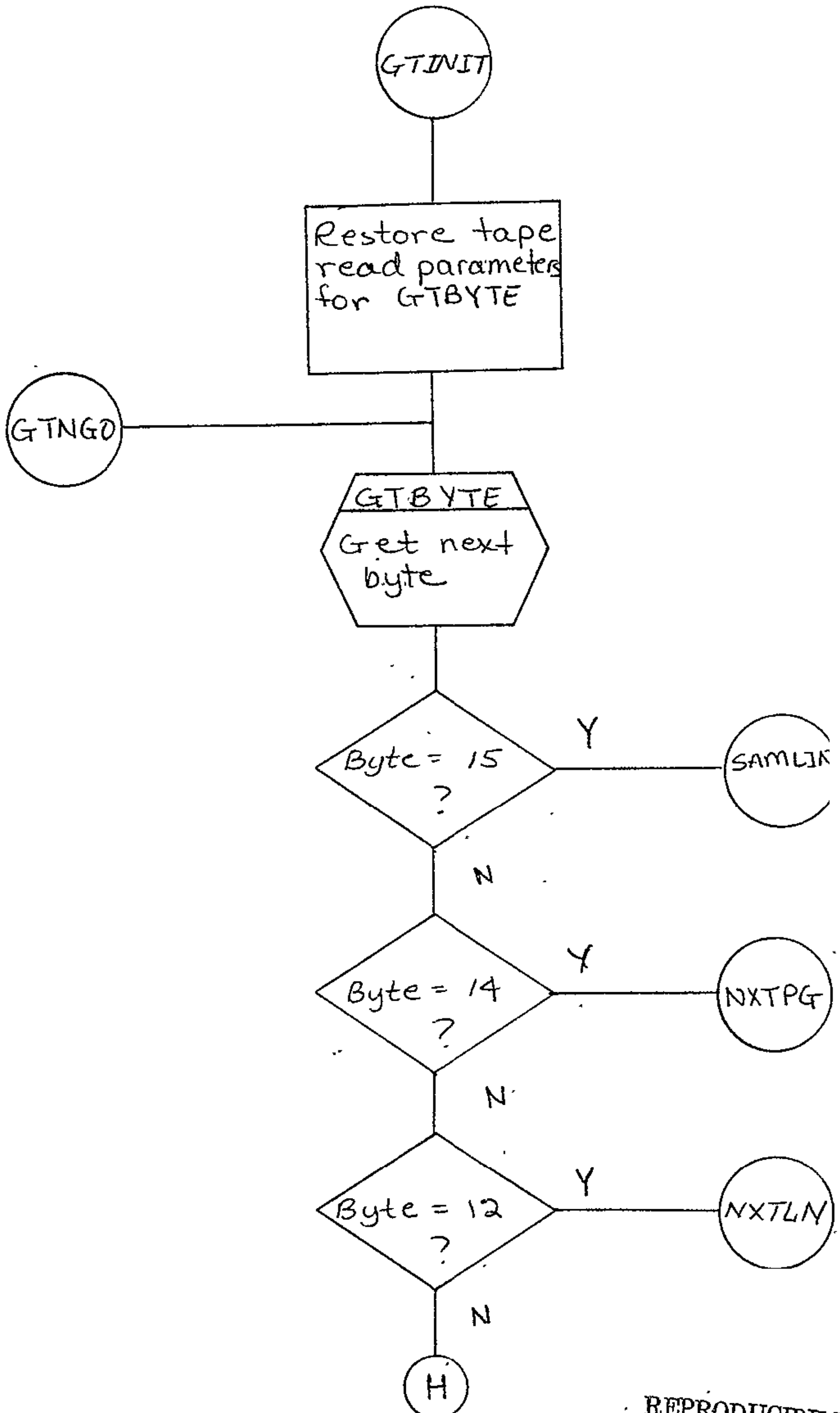

B
JOBTLE
Get job id info from operator
A
JOBID
Output eyeball-size info
SKP→S.FLAG to indicate batch id entered
HEADER
Set hardware
NEXPAG
Set up for new page
C

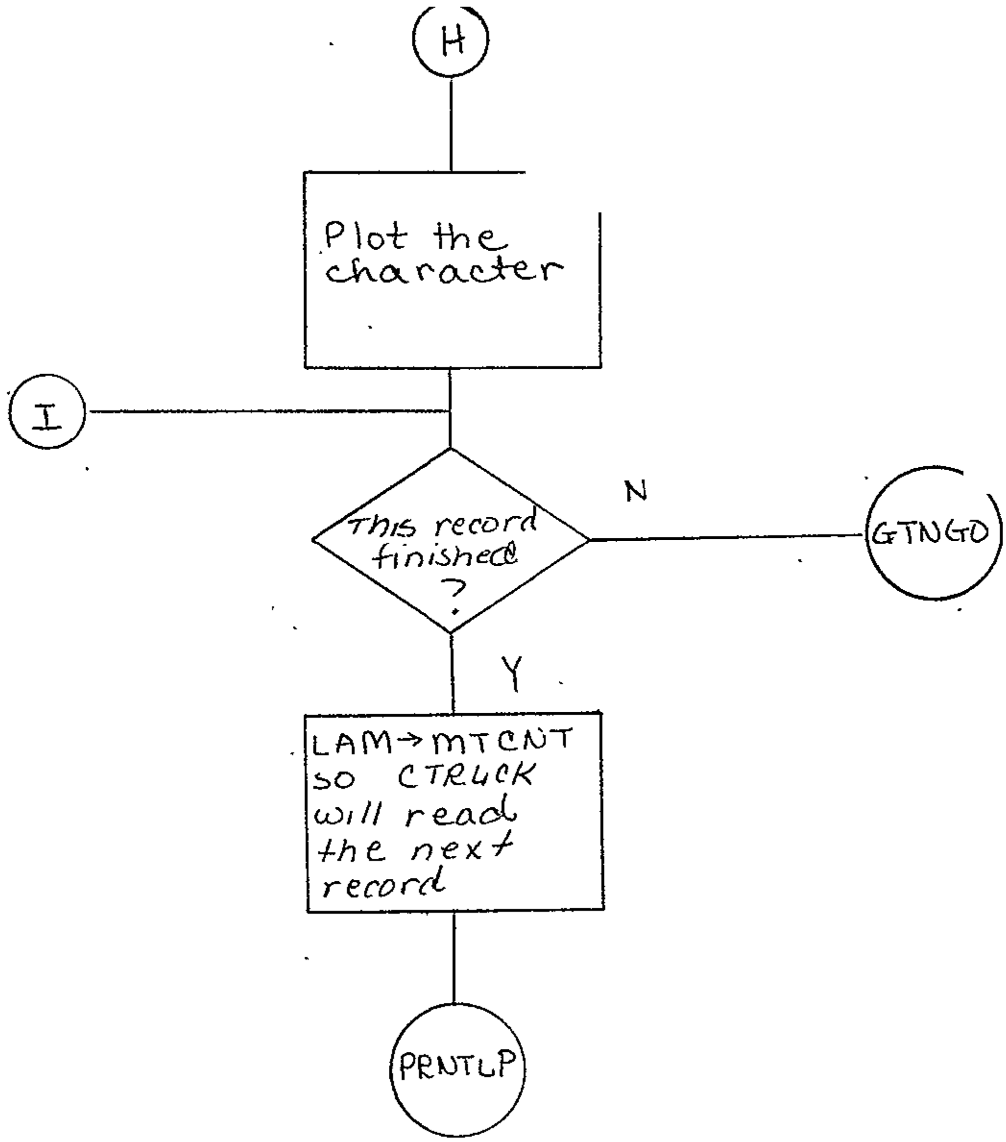

C
Load VCHTAB as the base address for the character generator
Y
NONE controls ?
F
N
E

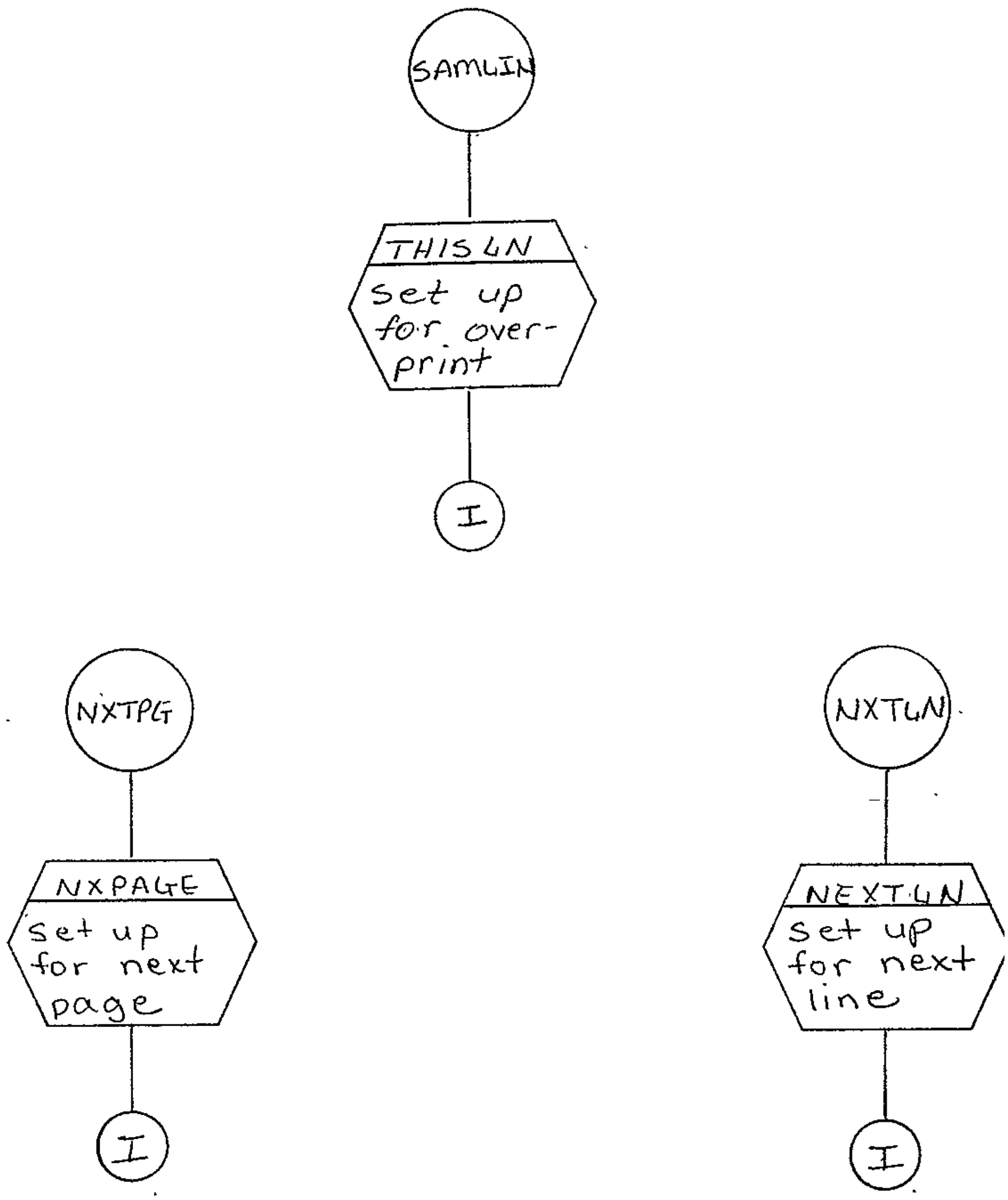


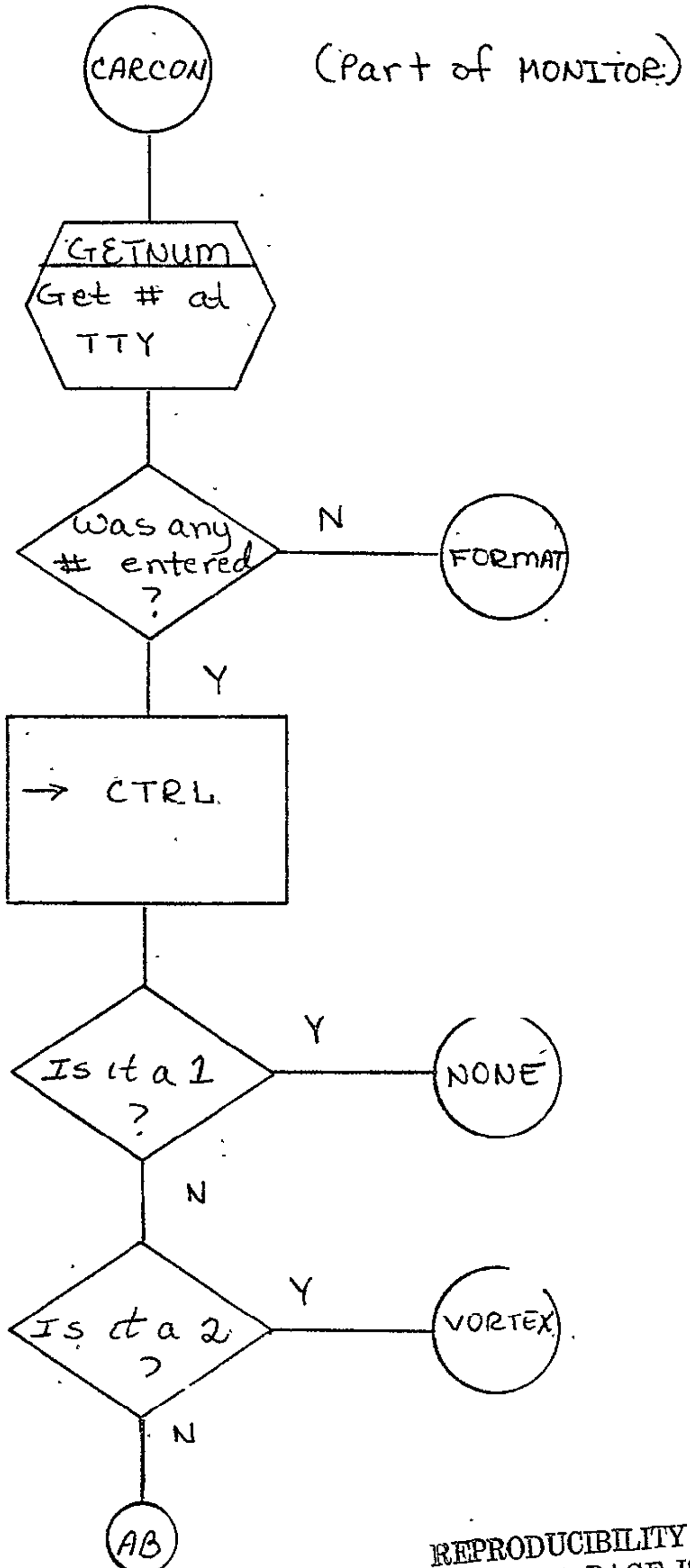
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

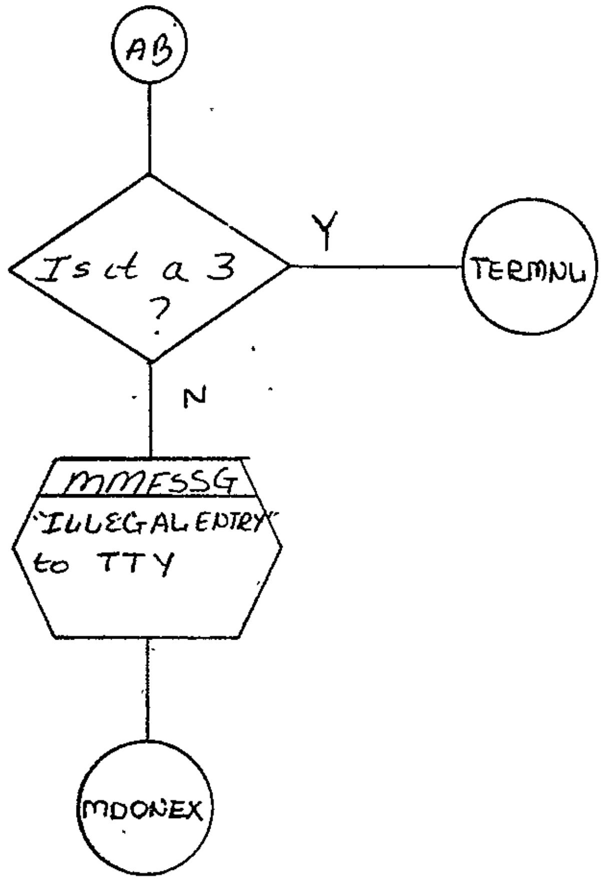

G
Load starting address for the character generator
TERMINAL controls ?
Y
GTINIT
Start character generator and print line.
LAM→MTCNT so CTRLCK will read next record
PRNTLP

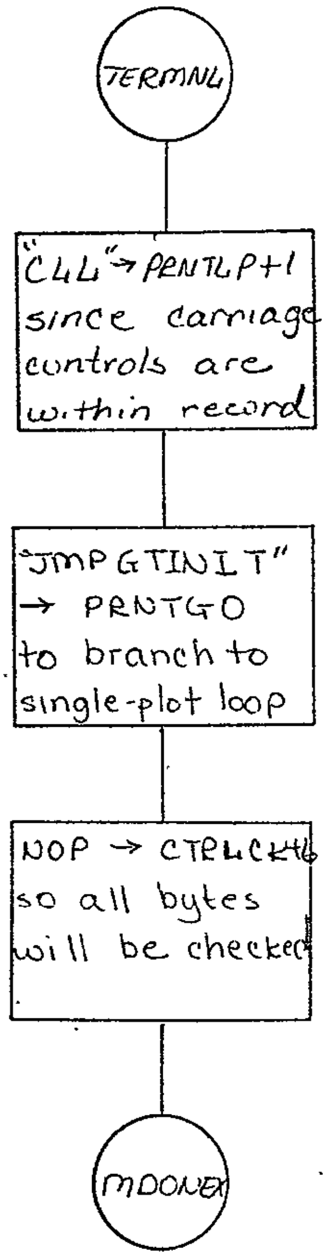

GTINIT
Restore tape read parameters for GTBYTE
GTNGO
GTBYTE
Get next byte
Byte = 15 ?
Y
SAMLIN
N
Byte = 14 ?
Y
NXTPG
N
Byte = 12 ?
Y
NXTLN
N
H

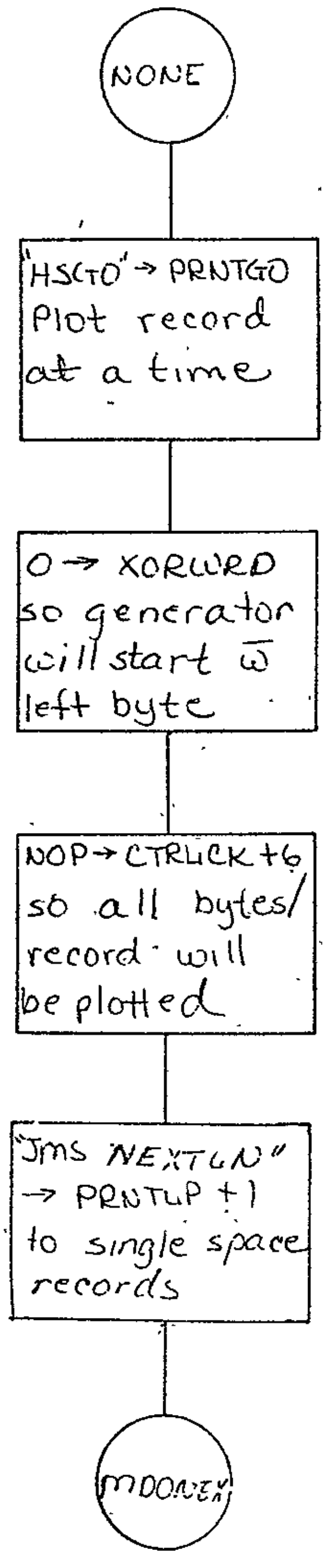

H
Plot the character
I
This record finished ?
N
GTNGO
Y
LAM→MTCNT so CTRUCK will read the next record
PRNTLP

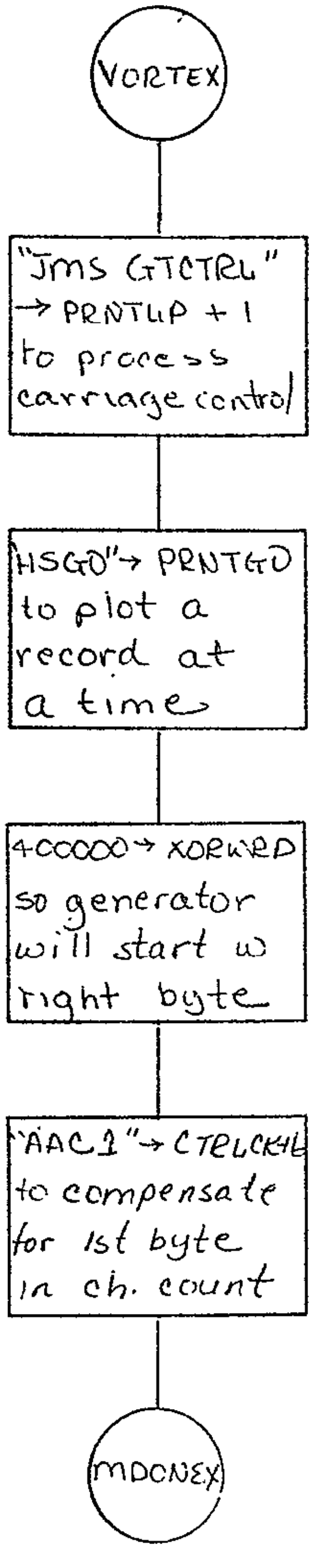

SAMLIN
THISLN
Set up for over-print
I
NXTPG
NXPAGE
Set up for next page
I
NXTLN
NEXTLN
Set up for next line
I

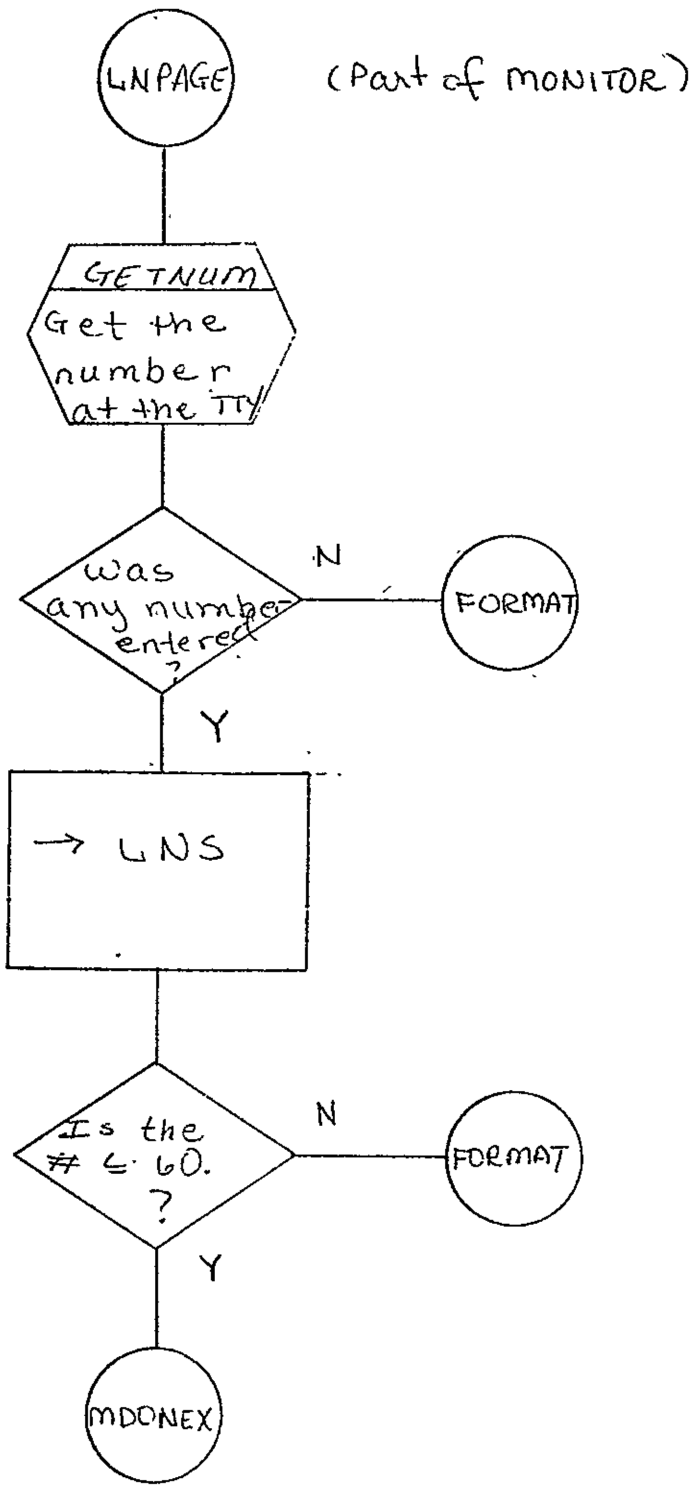

CARCON
(Part of MONITOR)
GETNUM
Get # at TTY
Was any # entered ?
N
FORMAT
Y
→ CTRL
Is it a 1 ?
Y
NONE
N
Is it a 2 ?
Y
VORTEX
N
AB

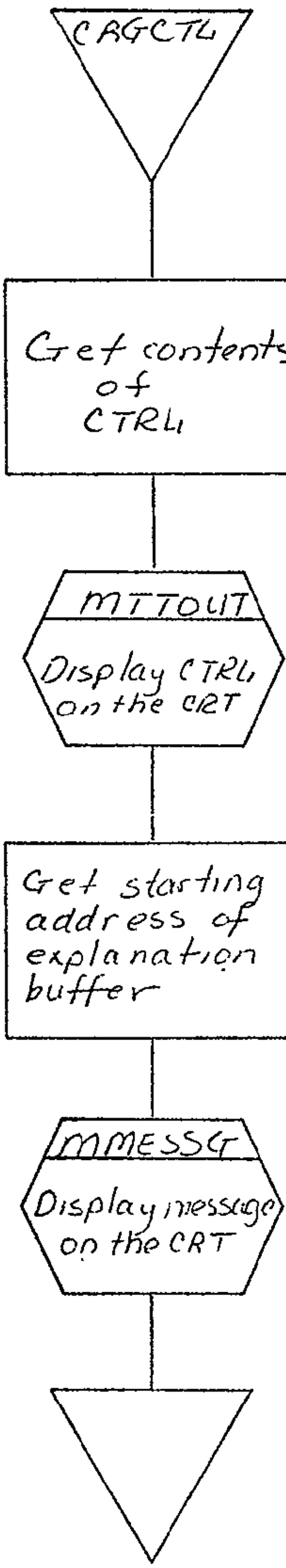

AB
Is it a 3
?
Y
TERMNU
N
MMESSG
"ILLEGAL ENTRY"
to TTY
MDONEX

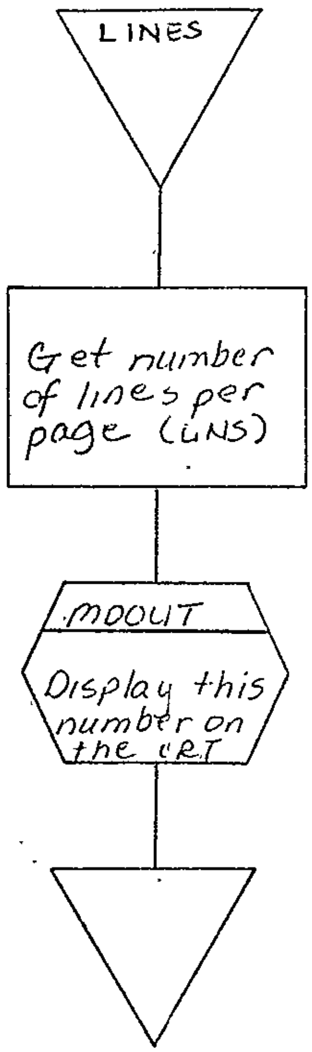

TERMNL
"C4L" → PRNTLP+1
since carriage
controls are
within record
"JMPGTINIT"
→ PRNTGO
to branch to
single-plot loop
NOP → CTRLCK16
so all bytes
will be checked
MDONEX

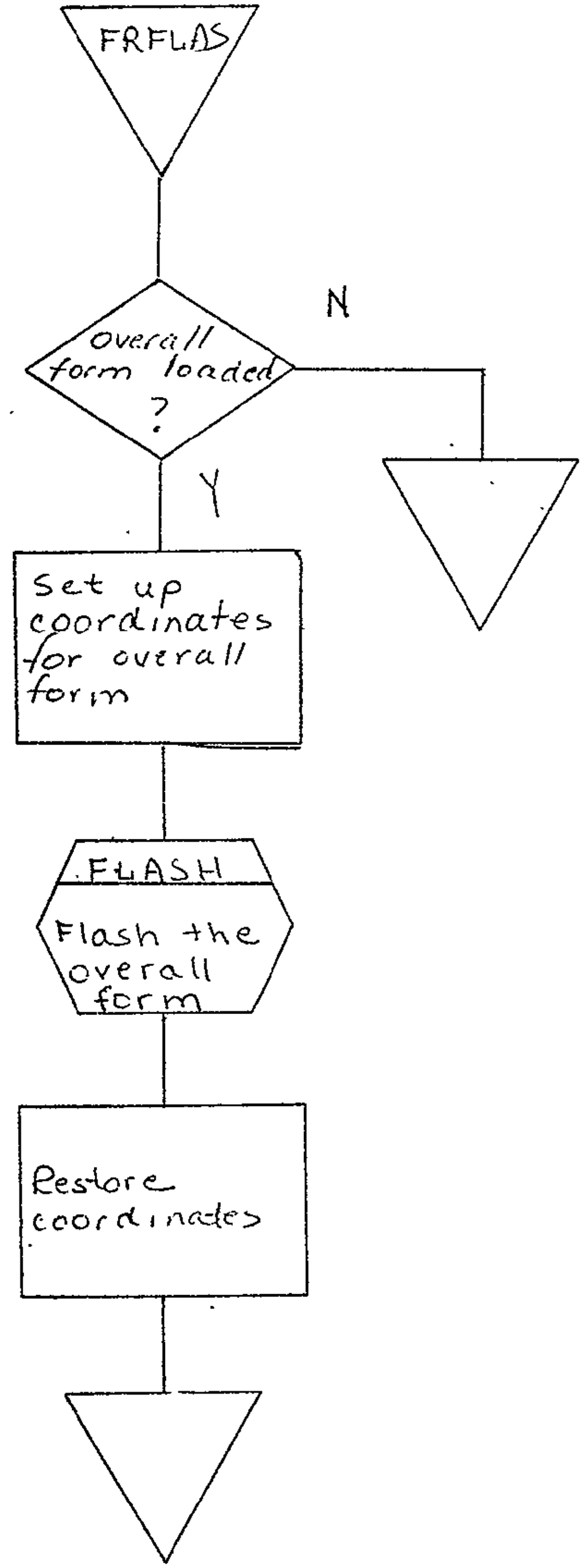

NONE
"HSGO" → PRNTGO
Plot record
at a time
O → XORWRD
so generator
will start w̄
left byte
NOP → CTRUCK+6
so all bytes/
record will
be plotted
"JMS NEXTLN"
→ PRNTLP +1
to single space
records
MDONEX

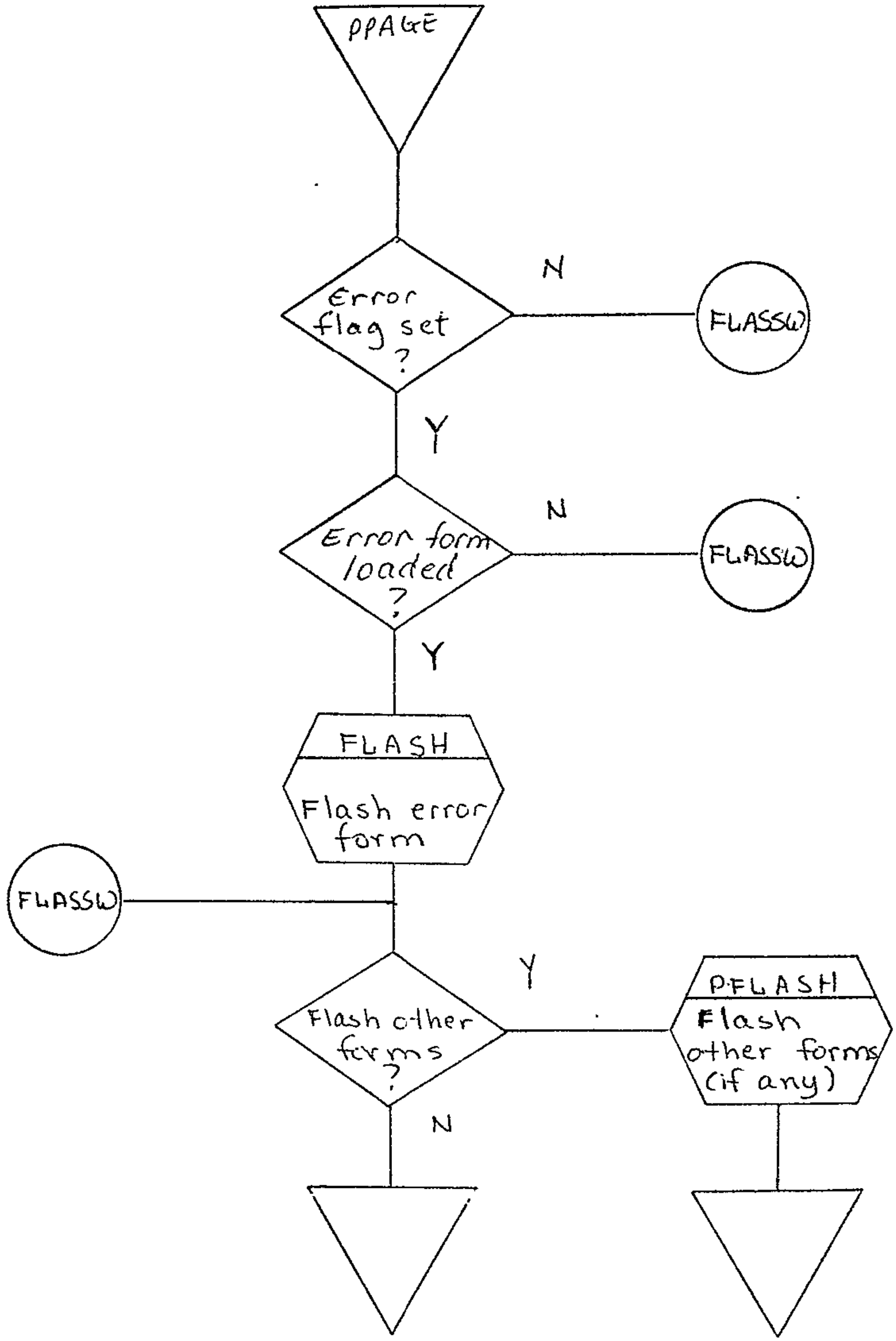

VORTEX
"JMS GTCTRL" → PRNTUP + 1 to process carriage control
HSGO" → PRNTGO to plot a record at a time
400000 → XORWRD so generator will start w right byte
"AAC 1" → CTRLCK4L to compensate for 1st byte in ch. count
MDONEX

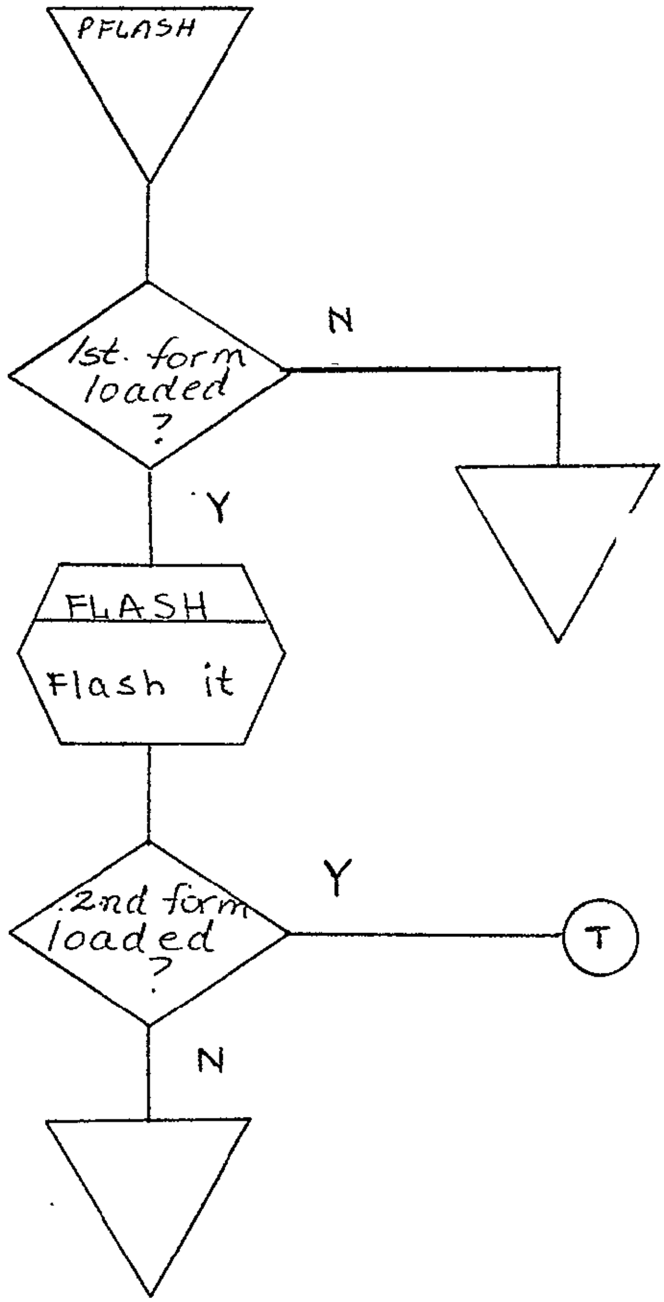

LNPAGE
(Part of MONITOR)
GETNUM
Get the number at the TTY
Was any number entered?
N
FORMAT
Y
→ LNS
Is the # ≤ 60. ?
N
FORMAT
Y
MDONEX

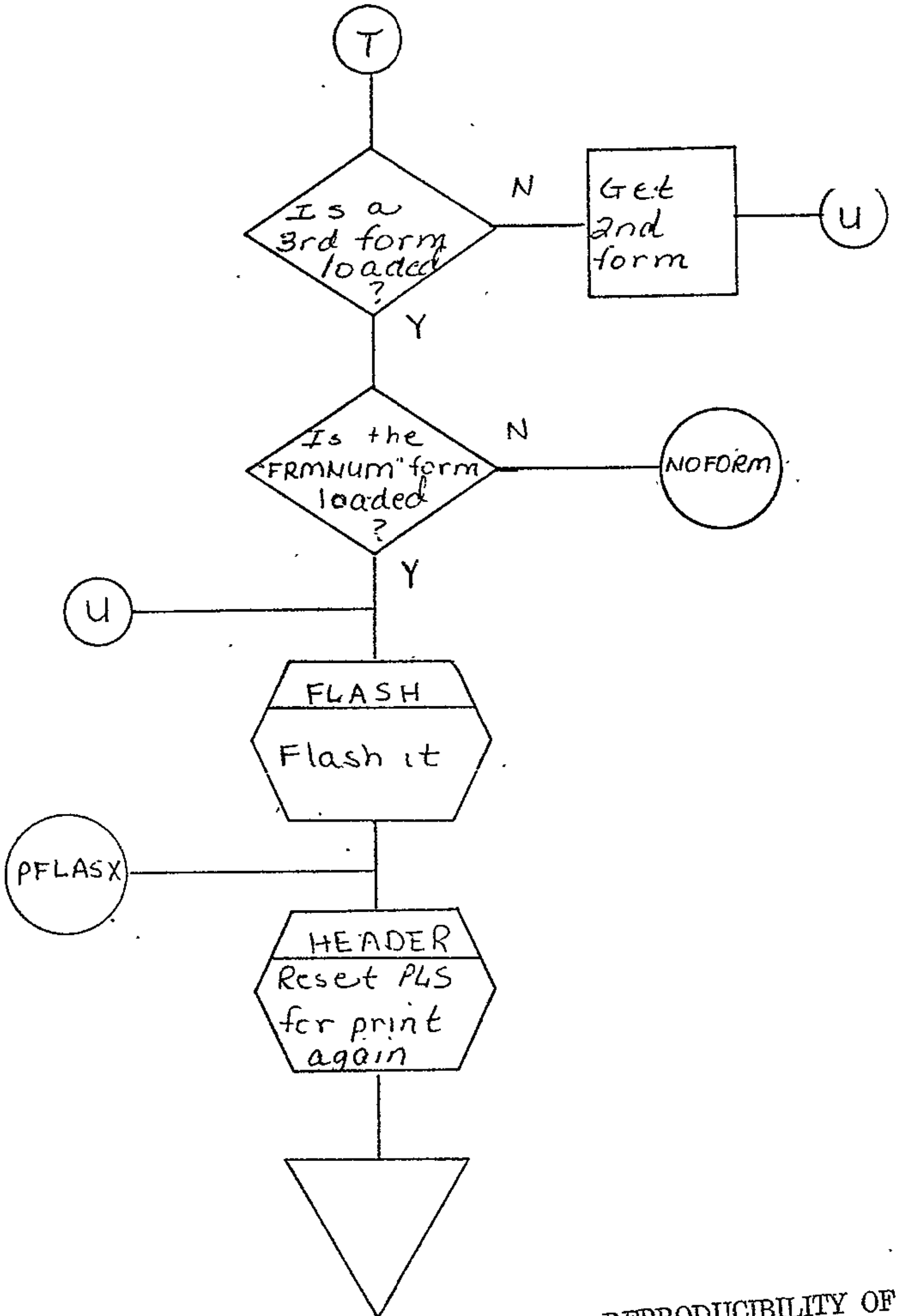

CRGCTL
Get contents of CTRL
MTTOUT
Display CTRL on the CRT
Get starting address of explanation buffer
MMESSG
Display message on the CRT

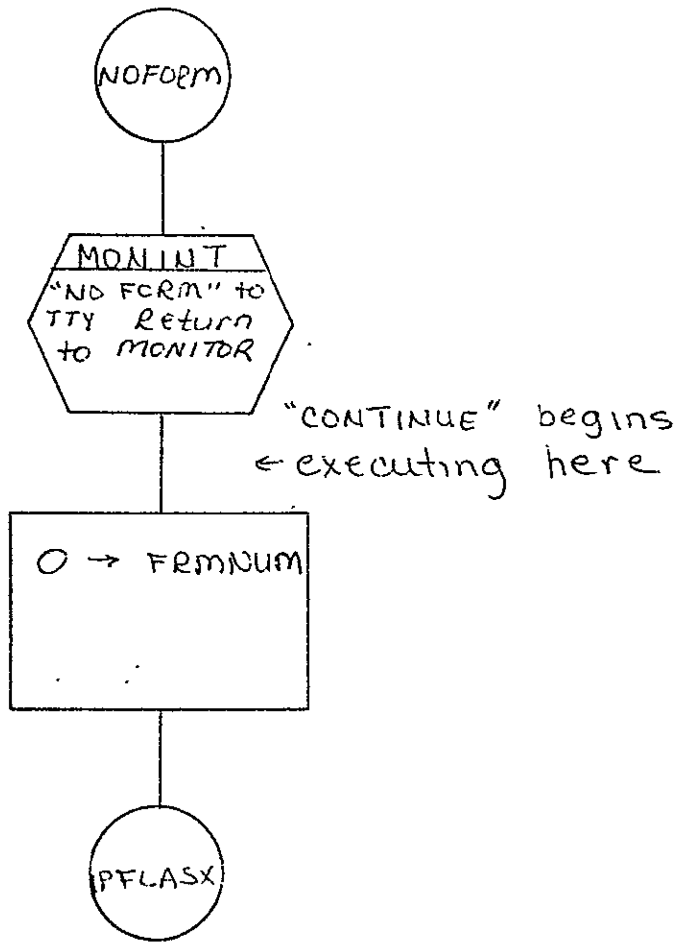

LINES
Get number of lines per page (LNS)
MOOUT
Display this number on the CRT

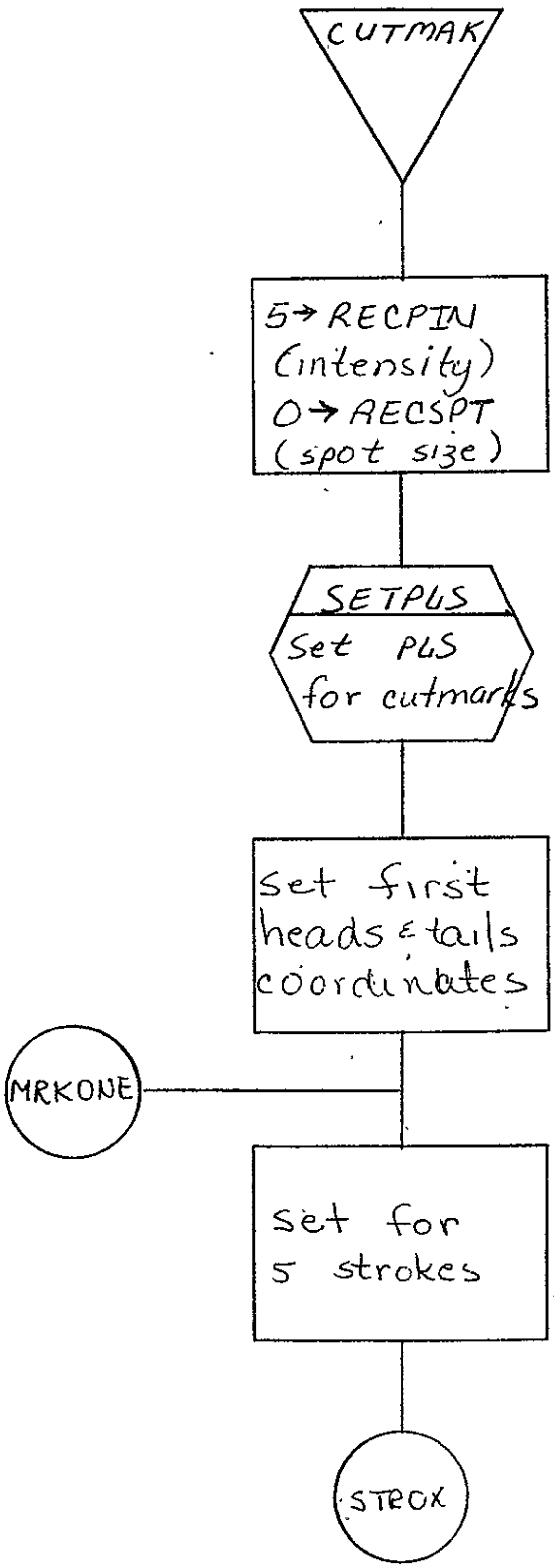

FRFLAS
overall form loaded ?
N
Y
Set up coordinates for overall form
FLASH
Flash the overall form
Restore coordinates

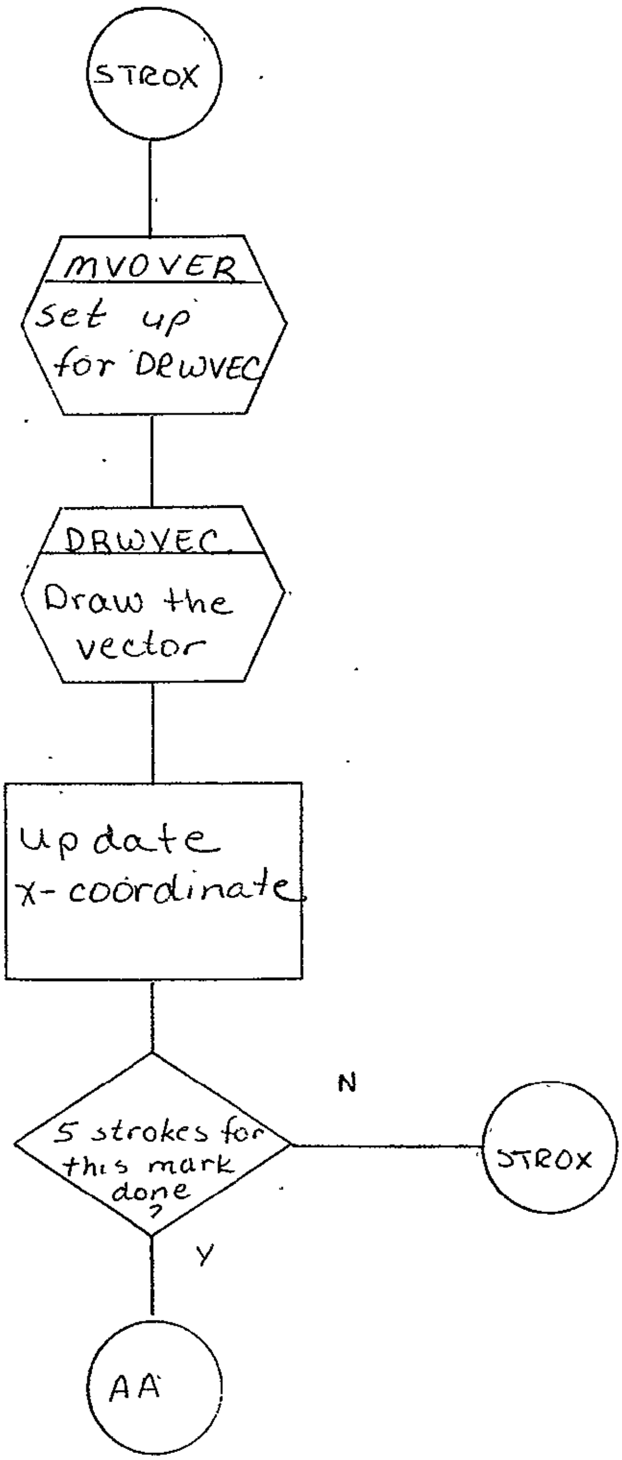

PPAGE
Error flag set ?
N
FLASSW
Y
Error form loaded ?
N
FLASSW
Y
FLASH
Flash error form
FLASSW
Flash other forms ?
Y
PFLASH
Flash other forms (if any)
N

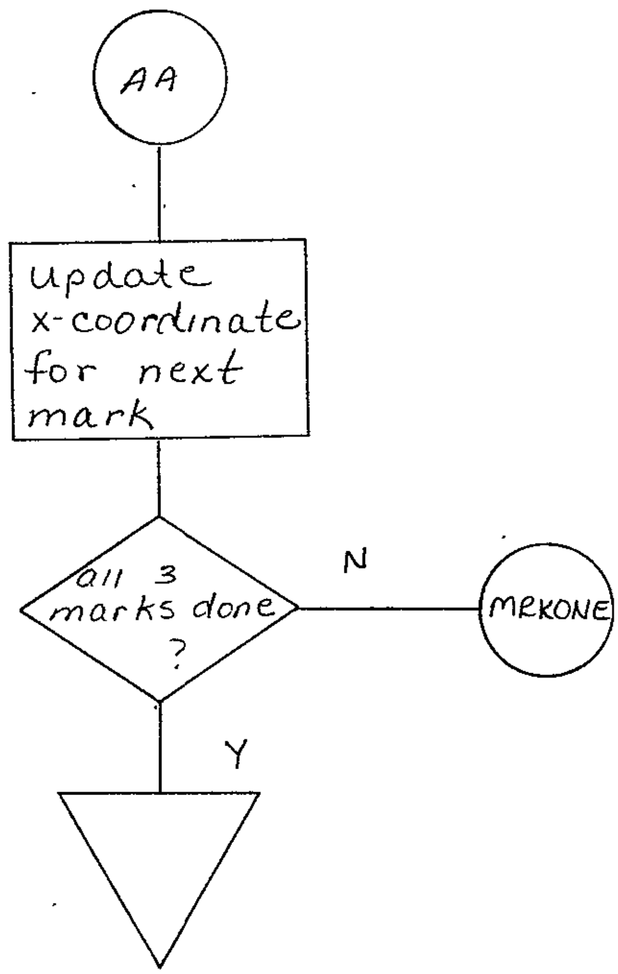

PFLASH
1st. form loaded ?
N
Y
FLASH
Flash it
2nd form loaded ?
Y
T
N

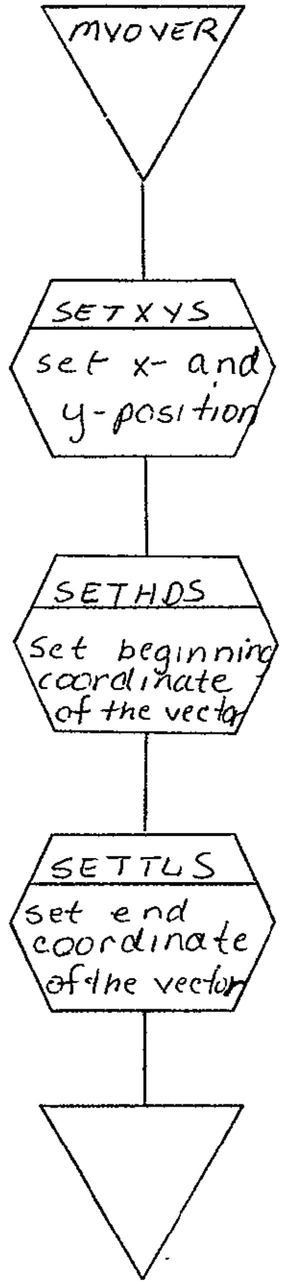

T
Is a 3rd form loaded ?
N
Get 2nd form
U
Y
Is the "FRMNUM" form loaded ?
N
NOFORM
Y
U
FLASH
Flash it
PFLASX
HEADER
Reset PLS for print again

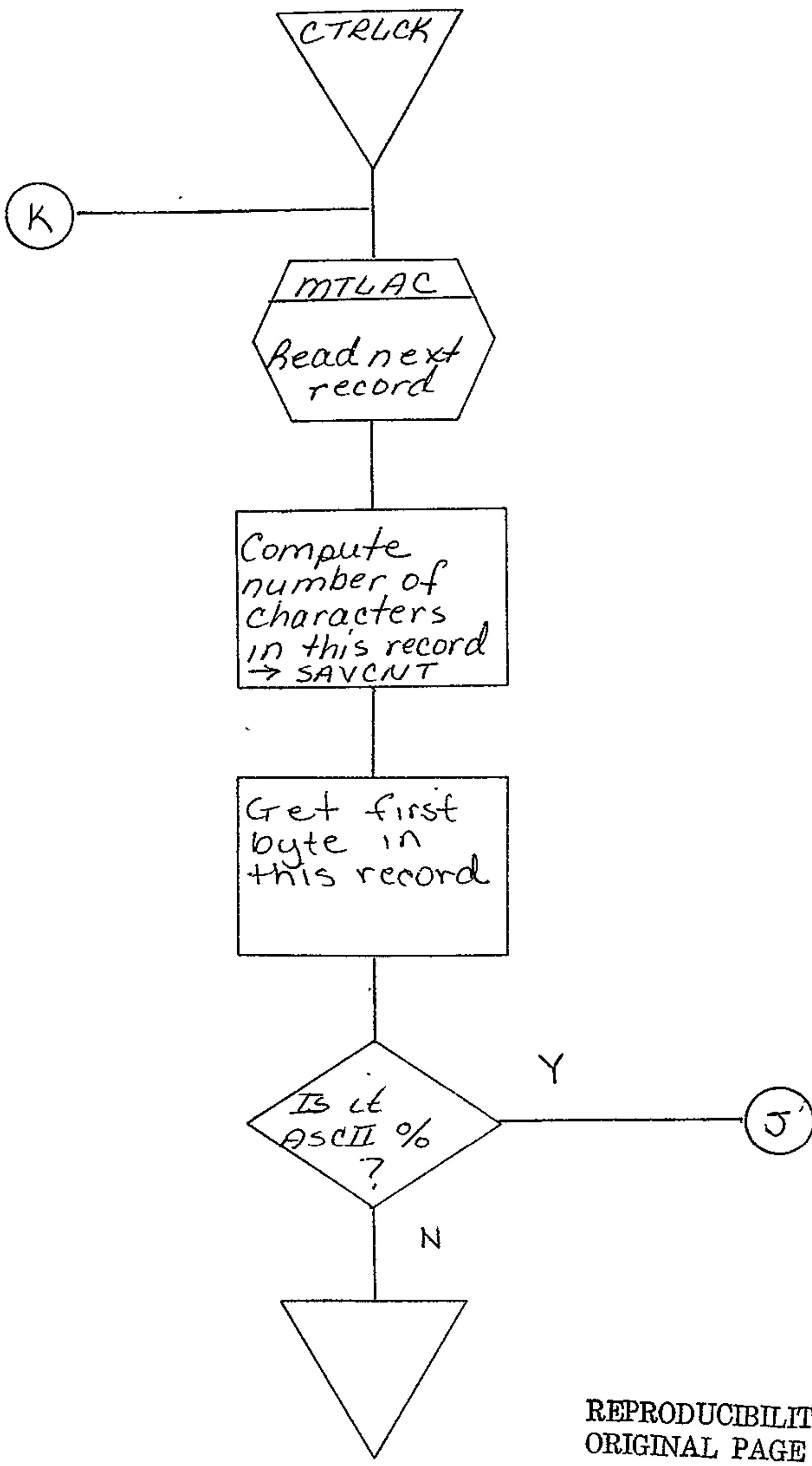

NOFORM
MONINT
"NO FORM" to TTY Return to MONITOR
"CONTINUE" begins executing here
O → FRMNUM
PFLASX


CUTMAK
5→RECPIN
(intensity)
0→AECSPT
(spot size)
SETPLS
Set PLS
for cutmarks
set first
heads & tails
coordinates
MRKONE
set for
5 strokes
STROX

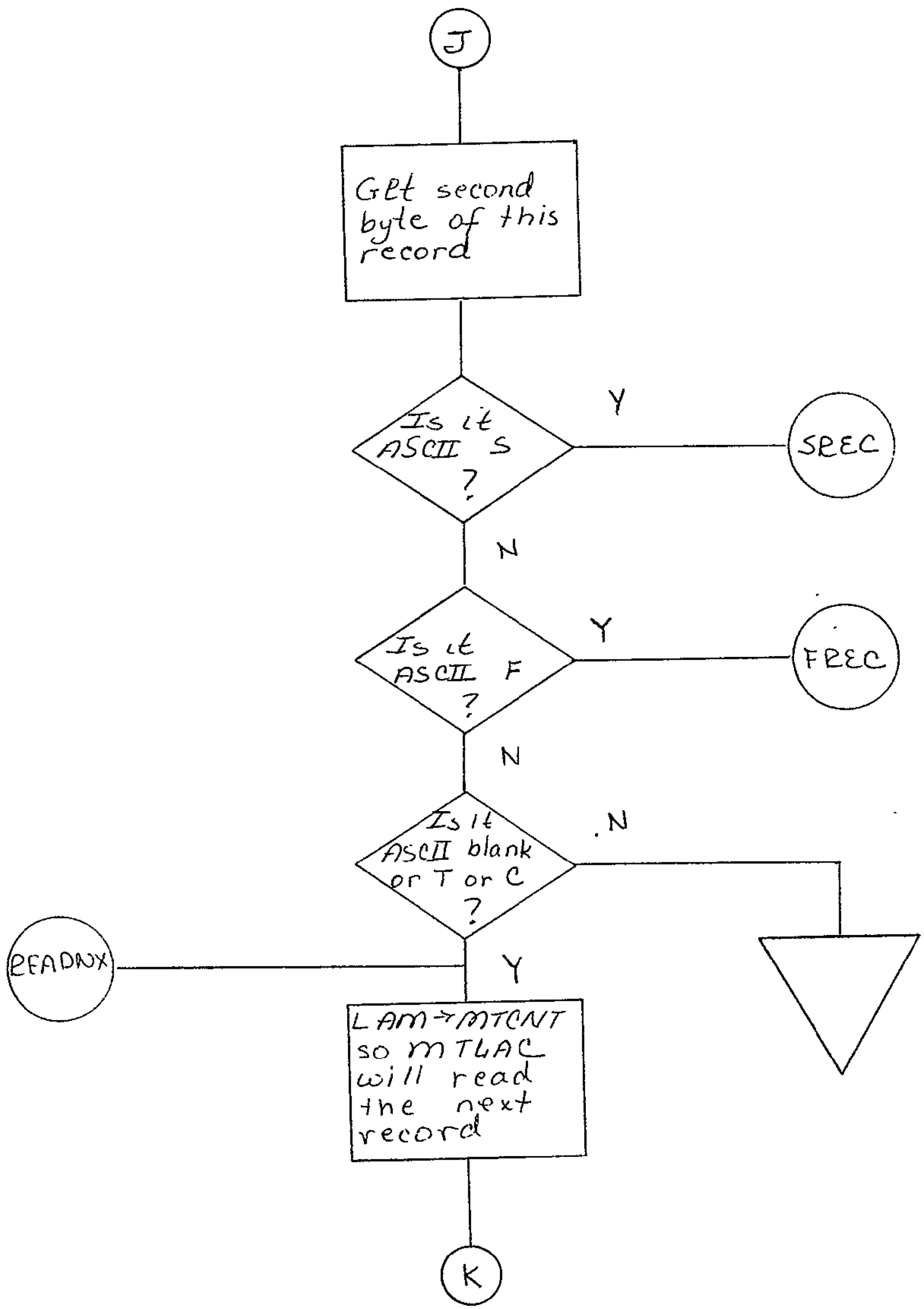

STROX
MVOVER
set up
for DRWVEC
DRWVEC
Draw the
vector
update
x-coordinate
5 strokes for
this mark
done
?
N
STROX
Y
AA

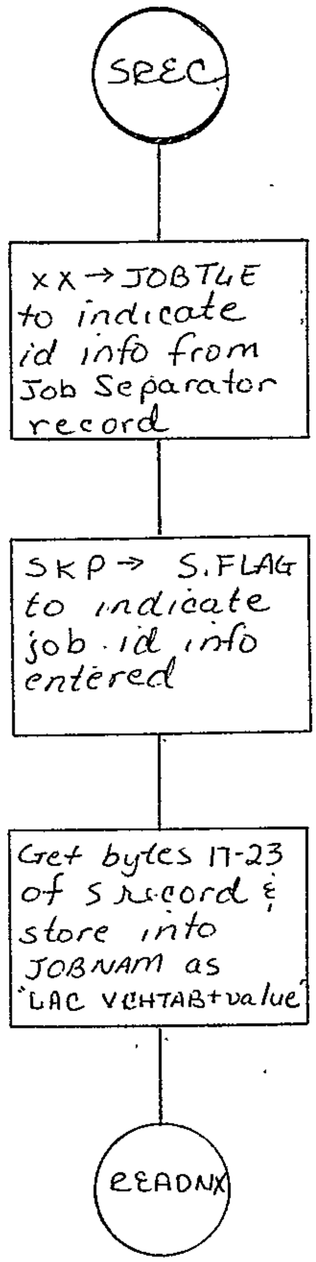

AA
update x-coordinate for next mark
all 3 marks done ?
N
MRKONE
Y

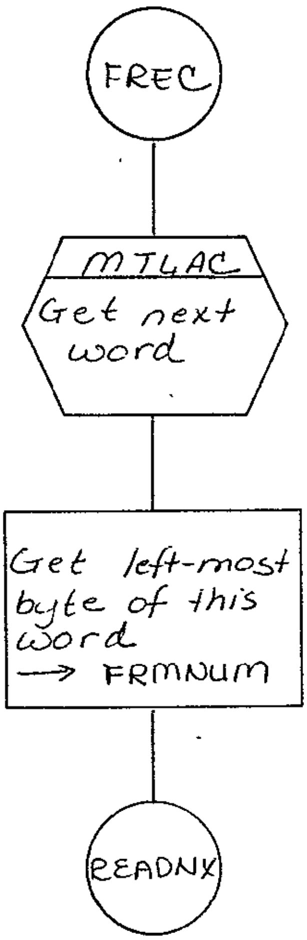

MVOVER
SETXYS
set x- and y-position
SETHDS
set beginning coordinate of the vector
SETTLS
set end coordinate of the vector

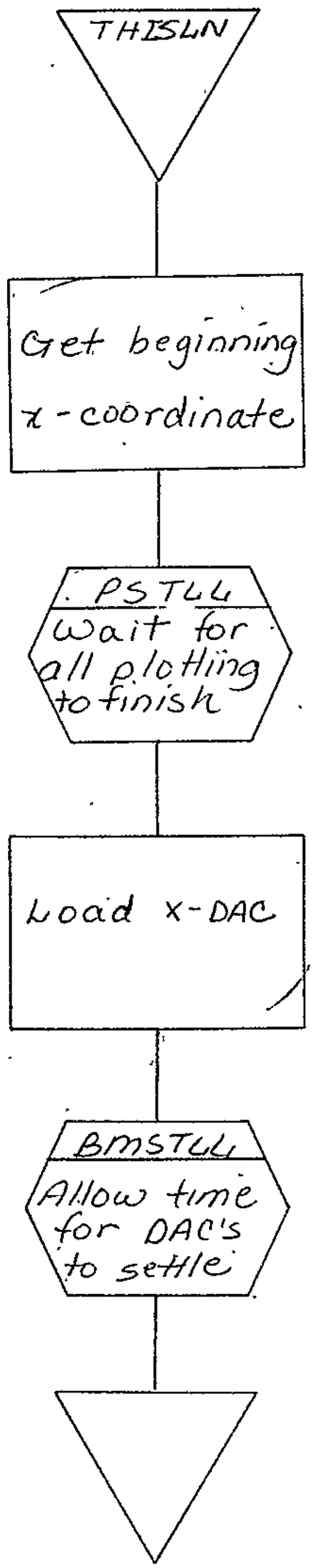


REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR

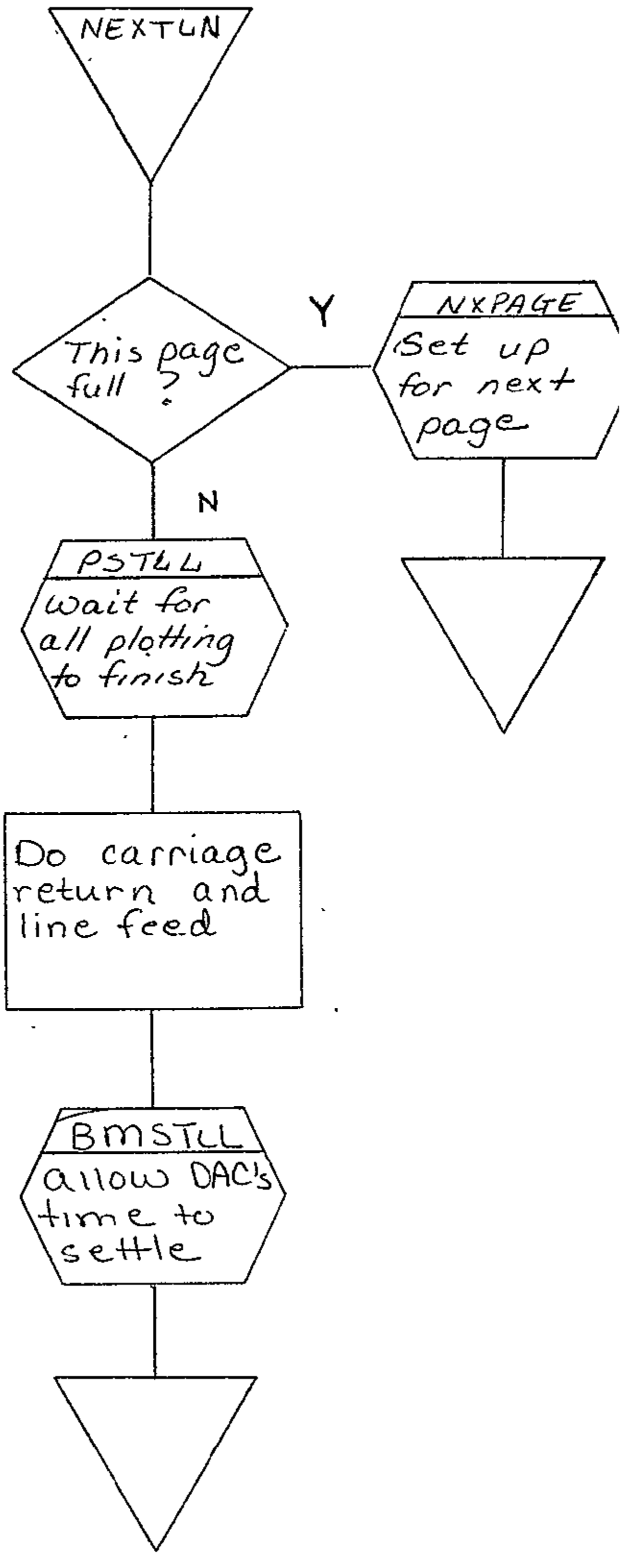

J
Get second byte of this record
Is it ASCII S ?
Y
SREC
N
Is it ASCII F ?
Y
FREC
N
Is it ASCII blank or T or C ?
N
Y
READNX
LAM→MTCNT so MTLAC will read the next record
K

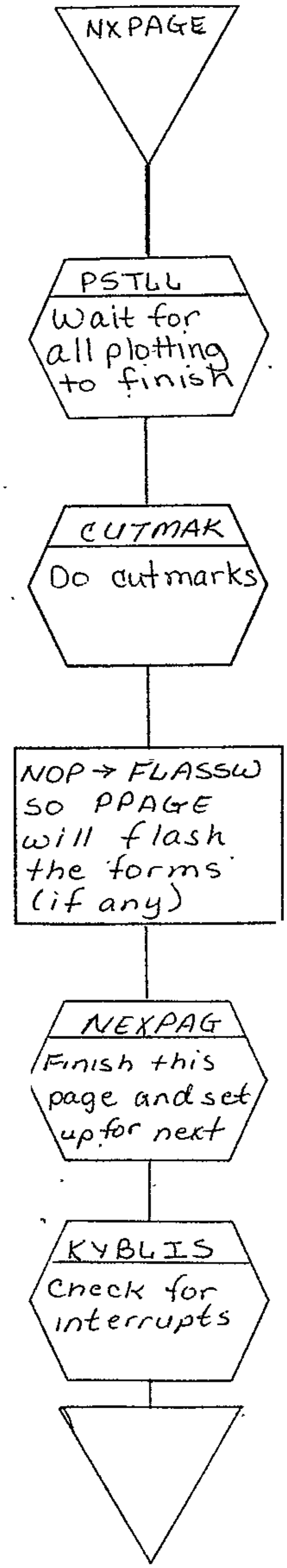

SREC
XX → JOBTLE to indicate id info from Job Separator record
SKP → S.FLAG to indicate job id info entered
Get bytes 17-23 of S record & store into JOBNAM as "LAC VCHTAB+value"
READNX


FREC
MT4AC
Get next word
Get left-most byte of this word
→ FRMNUM
READNX

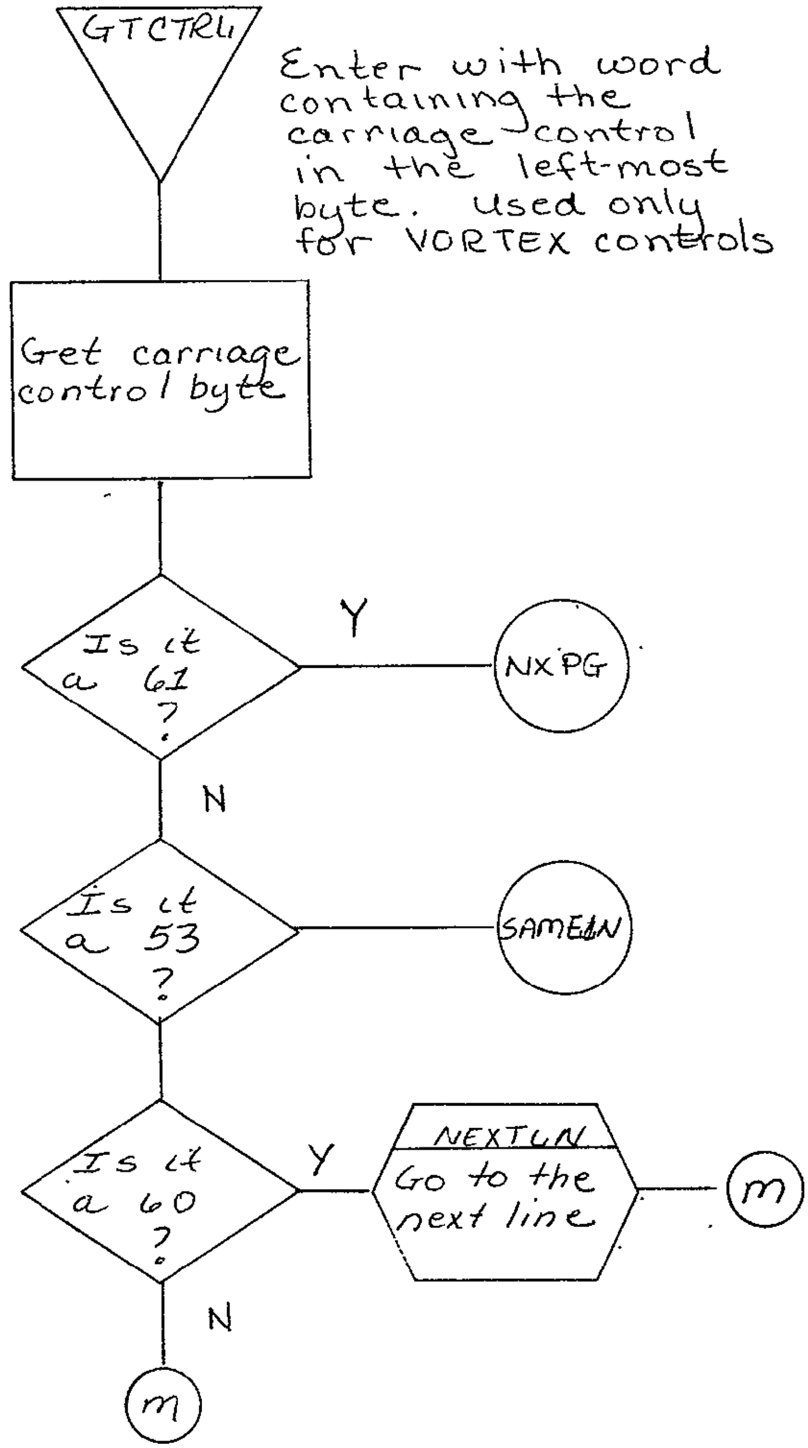


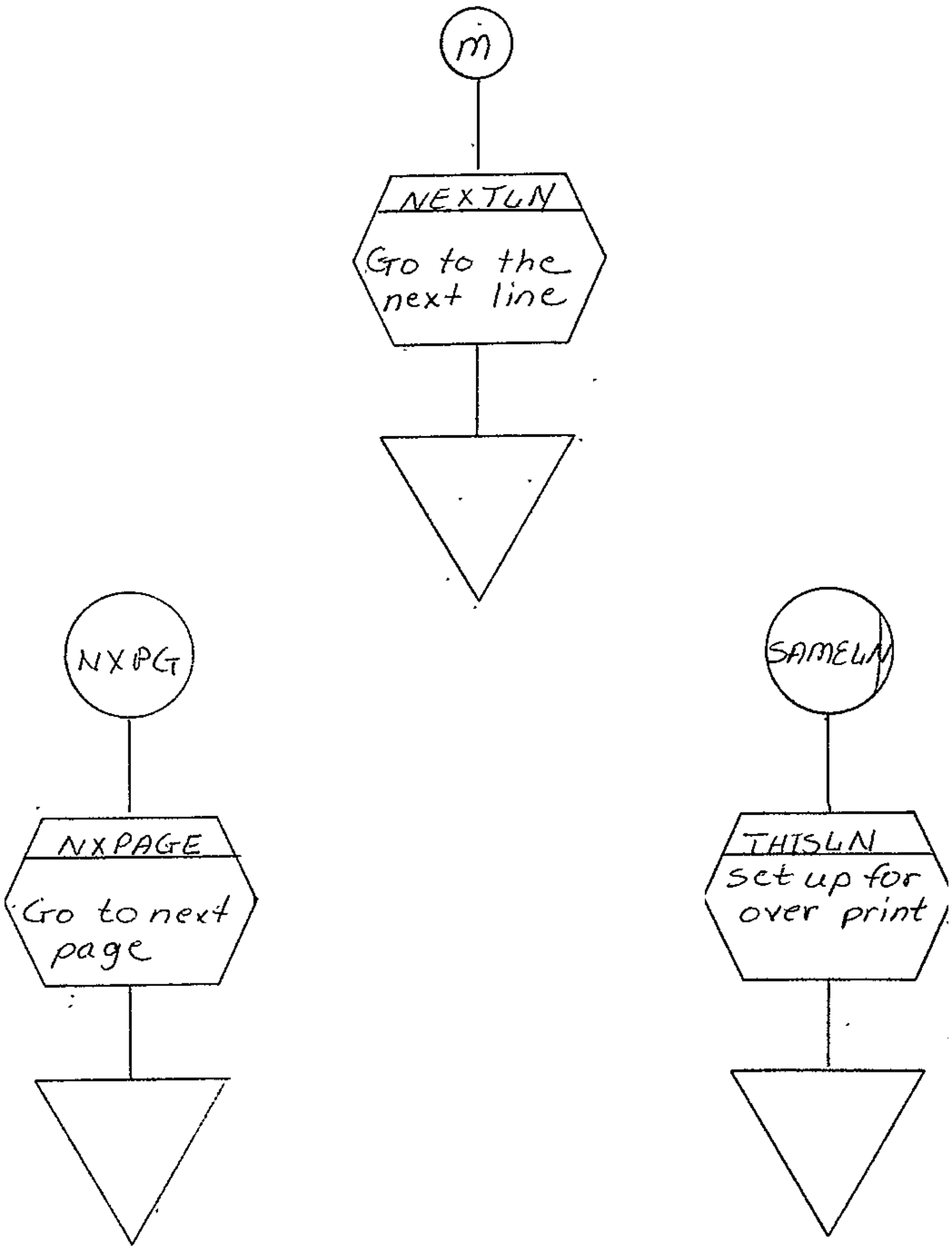
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

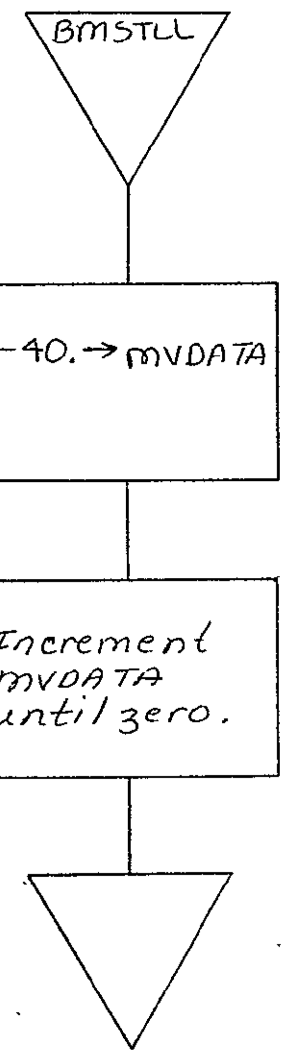

NEXTLN
This page full ?
Y
NXPAGE
Set up for next page
N
PSTLL
wait for all plotting to finish
Do carriage return and line feed
BMSTLL
allow DAC's time to settle

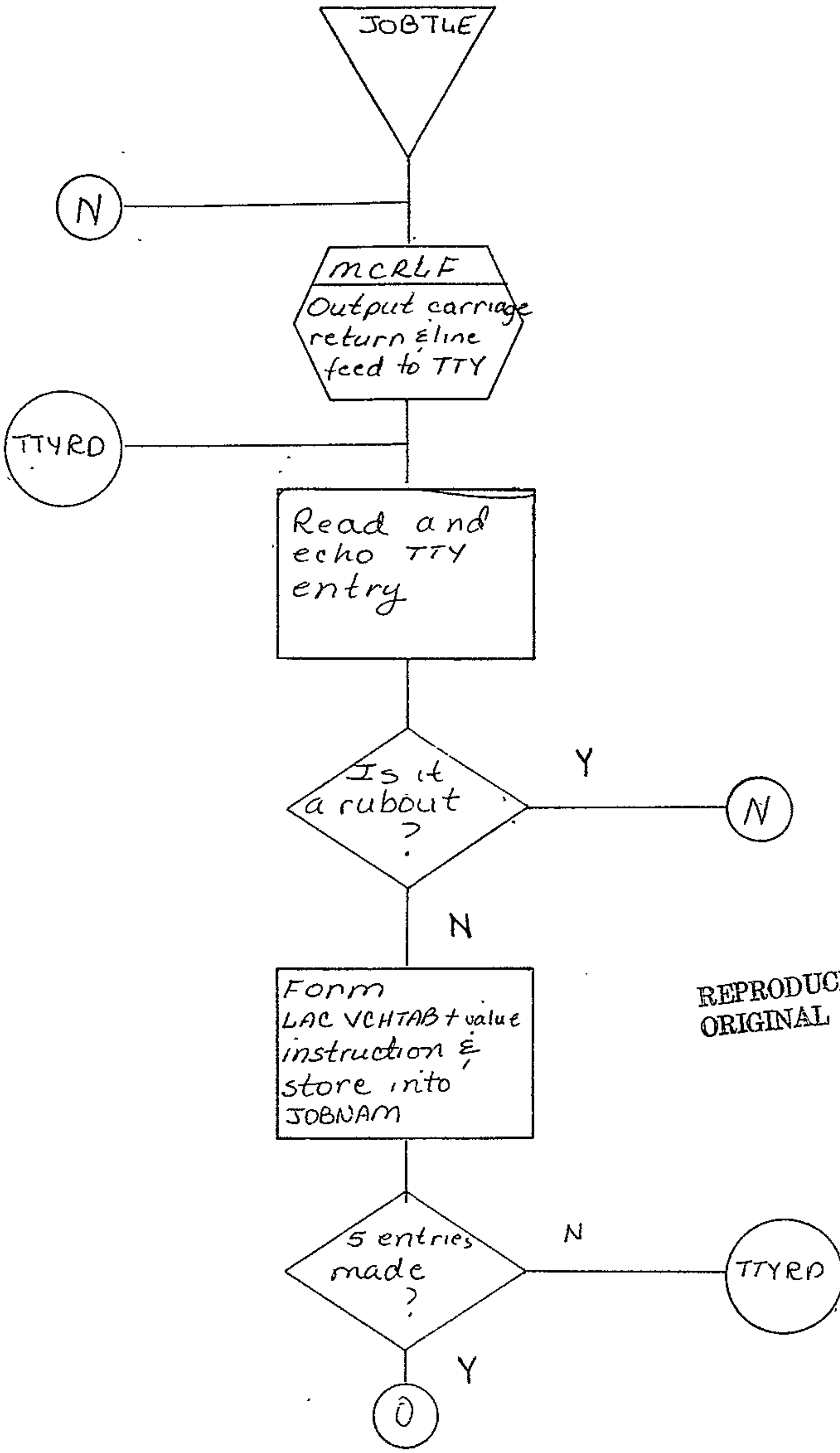


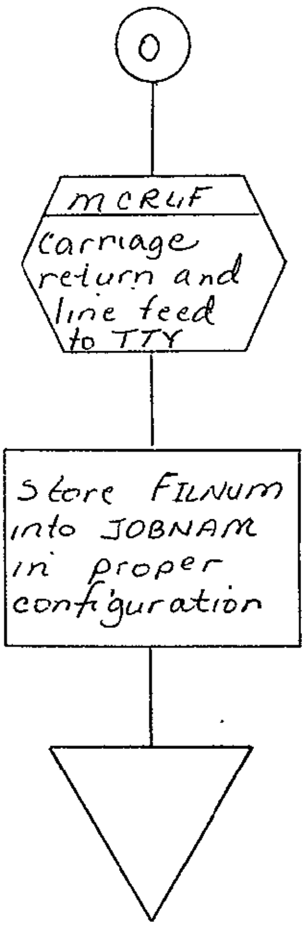
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

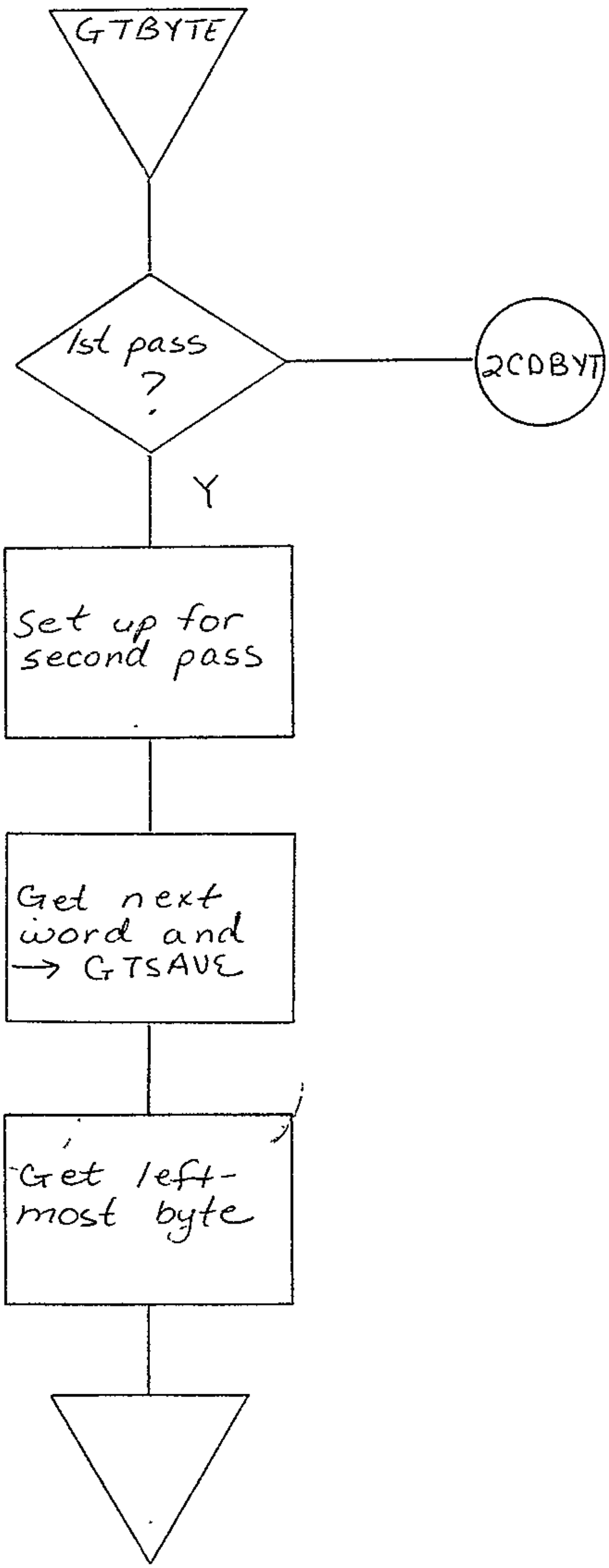

GTCTRL
Enter with word containing the carriage control in the left-most byte. Used only for VORTEX controls
Get carriage control byte
Is it a 61 ?
Y
NXPG
N
Is it a 53 ?
SAMELN
Is it a 60 ?
Y
NEXTLN
Go to the next line
m
N
m

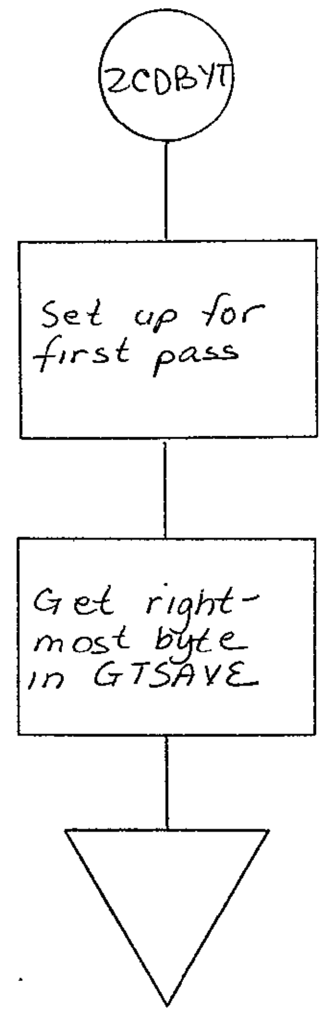

m
NEXTLN
Go to the next line
NXPG
NXPAGE
Go to next page
SAMELN
THISLN
set up for over print

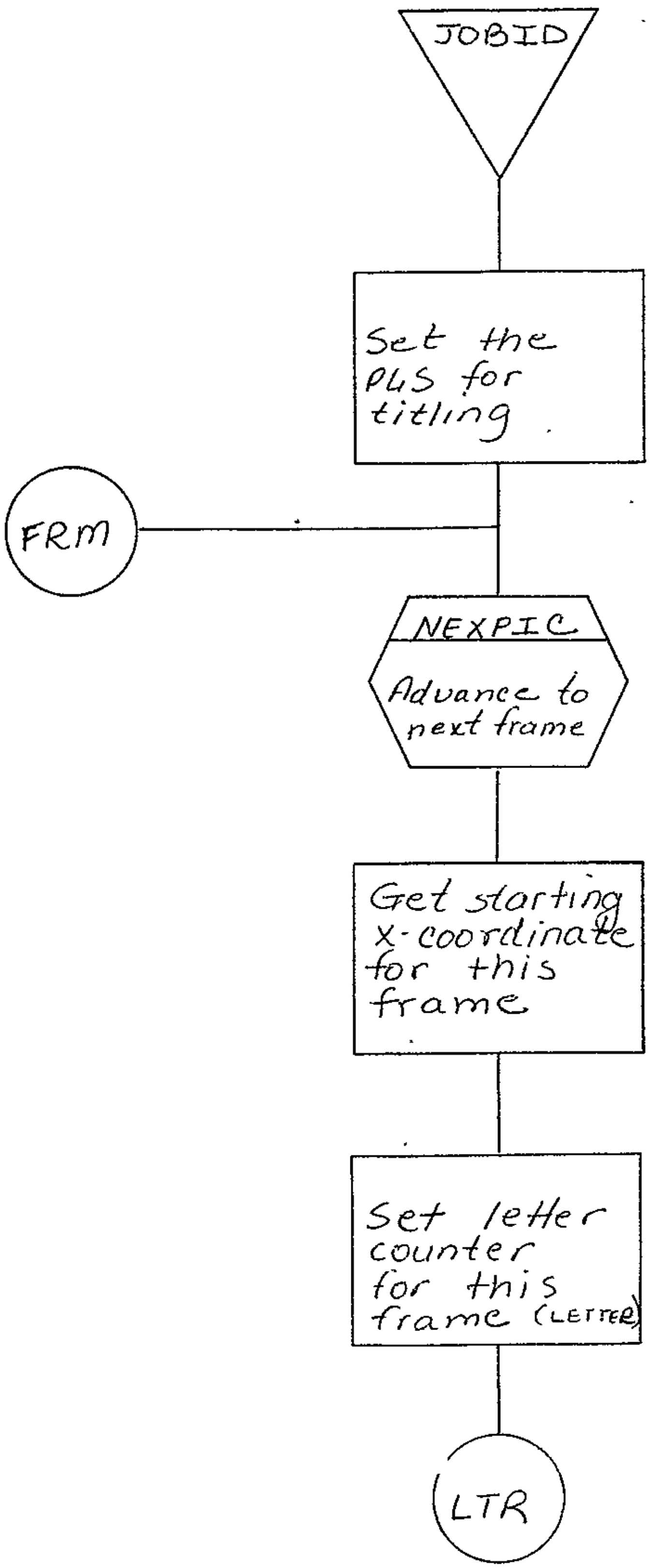

BMSTLL
-40. → MVDATA
Increment
MVDATA
until zero.

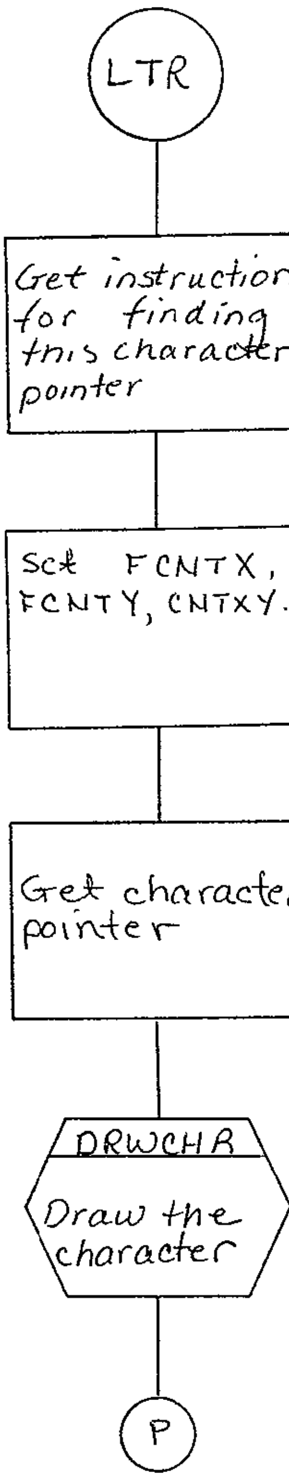

JOBTWE
N
MCRLF
Output carriage return & line feed to TTY
TTYRD
Read and echo TTY entry
Is it a rubout ?
Y
N
N
Form LAC VCHTAB + value instruction & store into JOBNAM
5 entries made ?
N
TTYRD
Y
O

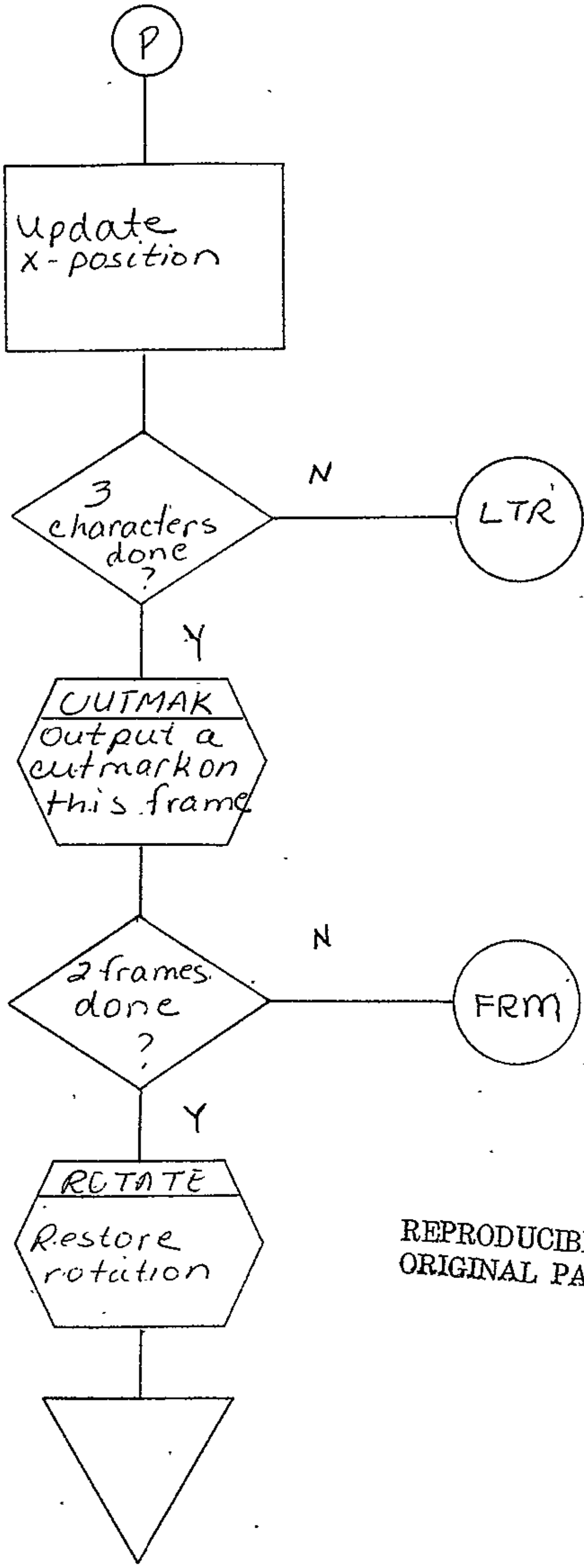

O
MCRLF
Carriage return and line feed to TTY
Store FILNUM into JOBNAM in proper configuration

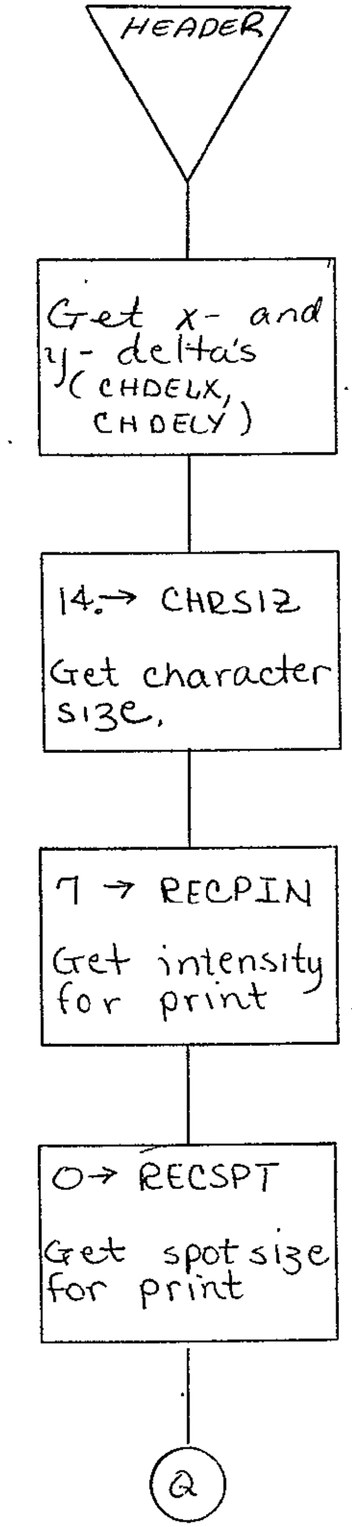

GTBYTE
1st pass ?
2CDBYT
Y
Set up for second pass
Get next word and → GTSAVE
Get left-most byte

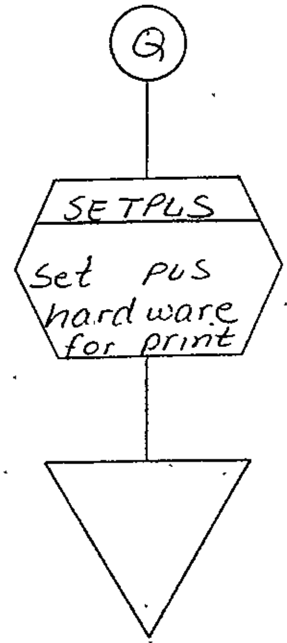

ZCDBYT
Set up for first pass
Get right-most byte in GTSAVE

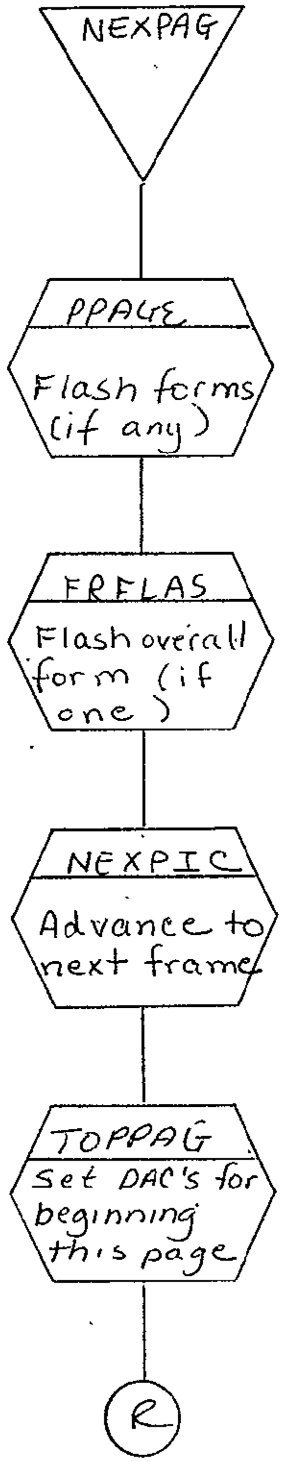

JOBID
Set the PLS for titling
FRM
NEXPIC
Advance to next frame
Get starting x-coordinate for this frame
Set letter counter for this frame (LETTER)
LTR

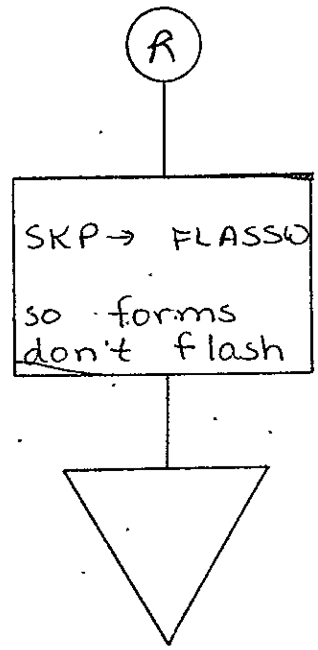

LTR
Get instruction for finding this character pointer
Set FCNTX, FCNTY, CNTXY.
Get character pointer
DRWCHR
Draw the character
P

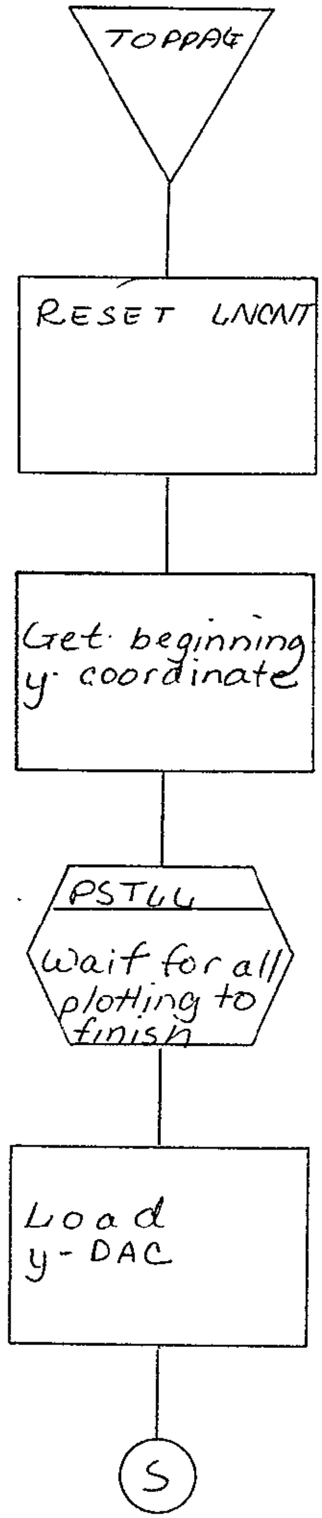

P
Update x-position
3 characters done ?
N
LTR
Y
OUTMAK
Output a cutmark on this frame
2 frames done ?
N
FRM
Y
ROTATE
Restore rotation

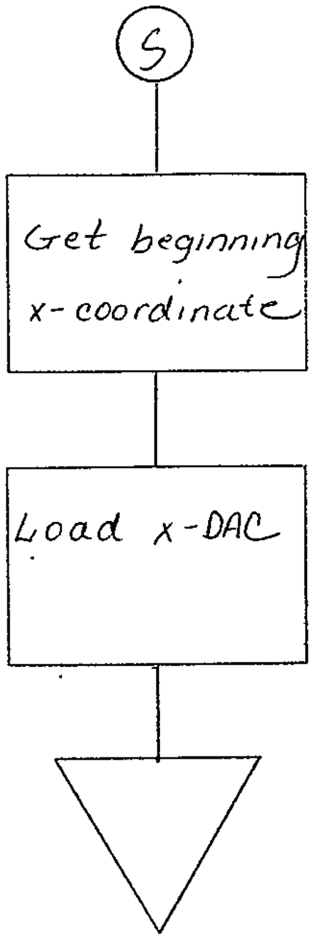

HEADER
Get x- and y- delta's (CHDELX, CHDELY)
14.→ CHRSIZ
Get character size.
7 → RECPIN
Get intensity for print
0→ RECSPT
Get spot size for print
2


Q
SETPUS
Set PUS hardware for print


NEXPAG
PPAGE
Flash forms (if any)
FRFLAS
Flash overall form (if one)
NEXPIC
Advance to next frame
TOPPAG
Set DAC's for beginning this page
R


R
SKP→ FLASSO
so forms
don't flash


TOPPAG
RESET LNCNT
Get beginning y coordinate
PSTLL
Wait for all plotting to finish
Load y-DAC
S


S
Get beginning x-coordinate
Load x-DAC

2.4 COMA VARIAN 73 PRINT PROCESSOR FOR 105 mm FICHE (VAR105)

2.4.1 Background

A. Author. B. Miller, Aeronutronic Ford Corporation

B. Intent. The requirements for this program are specified in SH-25752.

C. Program History

1. Production Tape Date. 26 November 1974

2. Author. B. Miller

3. Authorization. Clarification form A15; SH-25752

4. Test Case. TPS (JSC Form 1225) Number A5.

5. Revisions. Reference Appendix B, paragraph B.4

2.4.2 Introduction

2.4.2.1 Hardware Requirements

- FR80 with 12K memory
- 7- and 9-track tape drive
- 105 mm fiche camera

2.4.2.2 Software Requirements

VAR105	III161	III164 FILM
105SUB	III161 GO	III185
III109	III147	III187
III166	III162	NULL
III166 INVAR	III162 MACRO	FORM1 thru FORM4
III166 ADVAN	III163	
III166 TABLE	III164	

2.4.2.3 Assembly Parameters

A. ALLOW. Allows code for forms loading and flashing to be assembled.

B. ASCII. Causes the 7-bit ASCII table to be assembled as VCHTAB.

C. BATCH. Allows code for batch processing to be assembled.

D. BIGBUF. If 0, allows the MONITOR to be assembled with a maximum number of features.

E. CAMNUM. If 9, camera parameters are assembled for the fiche camera.

F. FINDEX. Allows code for indexing to be assembled.

G. FONT. If 0, allows the assembly of the character font FILM.

H. FTYPE. Indicates the camera type (105).

I. INDEX. Allows code for indexing to be assembled.

J. MANYUP. Allows code for fiche processing (multiple images/frame) to be assembled.

K. MTMANY. If 0, code for using only one drive will be assembled in the tape routines.

L. MTPTR. If 10, auto-index register 10 will be MTPTR.

M. MTSIZE. Size of the teletype buffer.

N. MUMBLE. If 1, allows assembler to output program configuration during assembly.

O. NUMCAM. If 1, camera may not be changed at run time.

P. PTYPE. If 3, indicates forms are assembled for EBC.

Q. TITLE. Allows code for processing and outputting title information to be assembled.

R. TWOBUF. Allows code for double-buffered tape reads to be assembled.

S. VARIAN. Allows specific changes in the SYM files for Varian to be assembled.

T. 42INDX. Defines size of the buffer for storing index information for a fiche.

U. 7TRACK. If 1, allows code for 7-track read to be assembled.

V. 9TRACK. If 1, allows code for 9-track read to be assembled.

2.4.2.4 Operator Commands

```
*
*TIME=15:47'23.9"
*FRAME=0
*CURRENT PAGE=0
*GO
*CONTINUE
*TITLE
*END JOB
*MAKE FILM=1
*CLEAR
*ADVANCE
*TAPE TYPE - 2,5,8 OR 9=9
*BACK
*PARITY=1
*USE=1
*REWIND
```

```
*SKIP
*TRY AGAIN=10
*FORM=   NUL105   FORM1   FORM2   FORM3   FORM4
*INDEX FORM=   INDEX
*ERROR FORM=NO
*PITCH-MARGIN=35,52
*SIZE OF TITLE=7175,6150
*IMAGES PER FICHE=16,14
*HITS-CHARS,VEC,PTS,TITLE,CMARK=1,1,1,2,1
*FOCUS
*LOAD=VAR105
*ROTATION=0
*CARRIAGE CONTROLS=2
     1=NONE,2=VORTEX,3=TERMINAL
*LINES PER PAGE=60
*
```

2.4.3 Analysis

2.4.3.1 Major Control Section

A. Description. Prior to beginning processing of a tape, the operator has the capability to enter the type of carriage controls and the number of lines per page via MONITOR. The default values are VORTEX carriage controls and 60 lines per page.

After MONITOR receives the GO command, the program sets the location and length of the buffers (NEXBUF and CURBUF) to be used for the doubled-buffered tape read. Then IXINIT is called to initialize indexing parameters. FRSPIC is called to initialize for multiple images per frame. A NOP is put in IFLASW so that the index form won't be flashed on the blank fiche produced by FC7CLR. MTRINI is then called to initialize all pointers for the double-buffered read and to read the first two records into the corresponding buffers. CTRLCK checks for and processes fiche control records. CTRLCK will continue reading the tape and processing control records until the first data record is encountered.

If no job separator record was found (S.FLAG = NOP), JOBTLE requests tape identification information (five characters) from the operator. Also, DFCTRL loads and processes default job separator and titling information.

Before starting to output data, HEADER sets the PLS hardware for printing and TOPPAG sets the coordinates for the beginning of a page. IFLASW is changed to a SKP so that the index form will flash. VCHTAB, the table of eight- and seven-bit ASCII character code pointers, is loaded as the base address. Bit 0 is set when the base address is loaded so the character generator will be in the 8-bit/byte mode.

Then the program enters the main print loop. Here, processing branches to one of three different sequences depending on whether the carriage control is NONE, VORTEX or TERMINAL. For processing with NONE carriage controls, the routine CTRLCK reads the next record and checks to see if it is a control record. If so, it is appropriately processed and the next record is read and checked. This sequence continues until the print data is accessed. NEXTLN is then called to do a carriage return and line feed (or new page when the current page is full). The number of bytes in the record (MTCNT times 2) is loaded as the character count, and MTPTR, which contains the address of the current tape buffer, is loaded as the starting address. Then the character generator is started. After the line is plotted, the program returns to the beginning of the print loop where CTRLCK is called to read and check the next record.

When processing with VORTEX carriage controls, the routine CTRLCK performs the same function as above until a print record is accessed. GTCTRL then checks the first byte of this record and decides what carriage control to execute. MTCNT times 2 plus 1 (to compensate for the carriage control byte) is loaded as the count for the character generator. The starting address has bit 0 set so that the character generator will start with the right-most byte of the first word. The character generator is then started. After the line is plotted, the program returns to the beginning of the print loop where CTRLCK is called.

Processing with TERMINAL carriage controls requires that each byte be checked, since a carriage control may be any byte(s) in the record. CTRLCK performs the same function as above until a print record is accessed. SAVCNT (MTCNT times 2) is loaded and the character count and the contents of MTPTR is loaded as the starting address. The program then branches to GTINIT where MTCNT and MTPTR are initialized for GTBYTE. INDXER is zeroed so that IXLOAD is never called in NEXTLN. GTBYTE is set up for a first pass and IXCHCK is called to check for indexing on the current line. At GTNGO, GTBYTE is called to retrieve a byte from the current tape buffer. If the byte is not a carriage control, it is stored in TITARE if the current line is the index line, and then is plotted on film. The character count for the current line (IXCNT) is then incremented. Then, at ISZCNT, the 2's complement of the characters/record count (SAVCNT) is incremented. If the count is not exhausted, the program returns to GTNGO to get and process the next byte. When SAVCNT is exhausted, MTCNT is changed to a LAM so that the next record will be read. Then the program returns to the beginning of the print loop.

Terminal carriage control bytes are 214 (or 14), 212 (or 12), and 215 (or 15). If the byte retrieved at GTNGO is a 215 (or 15) the program branches to SAMLIN. A 214 (or 14) results in jumping to NXTPG and a 212 (or 12) causes the program to go to NXTLN.

At SAMLIN, the routine IX.DO processes the index information if the current line is the index line. Then the characters/line count (IXCNT) is zeroed and THISLN is called to set up for the overprint. The program then returns to ISZCNT. At NXTPG, NXPAGE is called. (If the last line output is the index line, the information in TITARE will be processed in NXPAGE.) IXCNT is initialized and IXCHCK is called to check for indexing with the first line. The program returns to ISZCNT. At NXTLN, IX.DO processes the indexing information if the line just filmed was the index line. NEXTLN then executes the carriage return/line feed (or goes to a new page when necessary). IXCHCK checks to see if the line to be output next is the index line. The program then returns to ISZCNT.

When an end-of-file is encountered, NEXPAG is called to finish the current page. Then FICFIN finishes the current fiche. If this file is the last one in this batch to be processed, S.FLAG is initialized to a NOP. If no job separator was encountered, the file number in the JOBNAM buffer is updated. The file number (FILNUM) is incremented and the record counter (RECNUM) and form number (FRMNUM) are initialized to zero. Then the next file is processed. Upon finding a second end-of-file, S.FLAG and JOBTLE are reinitialized for processing a different tape.

B. Input/Output

1. Input. Input is a 7- or 9-track Varian 73 print tape.
2. Output. Output is to 105 mm microfiche.

C. Linkages

1. External Routines

FCFIN	FLASH	INDXDO	MDOUT	MTRINI	ROTTST
FC7CLR	FRSPIC	KYBLIS	MMESSG	NEXPIC	SETPLS
FICTAP	GETNUM	MCRLF	MTLAC	PSTLL	

2. Internal Routines

BMSTLL	FRFLAS	IXCHCK	IX.DO	NEXPAG	PPAGE
CRGCTL	GTBYTE	IXINIT	JOBTLE	NEXTLN	THISLN
CTRLCK	GTCTRL	IXLOAD	LDINFO	NXPAGE	TOPPAG
DFCTRL	HEADER	IXPAGE	LINES	PFLASH	2SPACE

2.4.3.2 Subroutines

A. IXPAGE. Initializes each page for indexing by resetting th index line counter (INDXER), by putting a NOP in IXLDSW to indicate that the index information for this page has not been stored, and by blank-filling the index area of the buffer TITARE.

B. IXINIT. Called at the beginning of each job to default all indexing parameters. In the event that an indexing record is encountered, all the parameters will be reset. Otherwise the line number for indexing (INXLIN) shall be 1, indexing will start with the 32nd character (INXCHR), and the index field shall be 20 characters in length (IXXLEN).

C. IXLOAD. Used only for VORTEX and NONE processing. Loads the index line into the buffer TITARE and calls INDXO, which processes the index line. At the point in the program where IXLOAD is called, the data for the last line output is in the previous tape buffer, NEXBUF. The record, beginning with the second byte if processing with VORTEX controls, is transferred one byte per word into the buffer TITARE by the subroutine GTBYTE. A SKP is deposited in IXLDSW to indicate that the page has been indexed and MTPTR is restored for the print loop.

D. LDINFO. Used to load the default job titling and the job separator information into TITARE. Then the subroutine FICTAP is called to process the information in the buffer. LDINFO is called with the 2's complement of the number of entries to be transferred to TITARE in the accumulator. The next instruction after the JMS LDINFO should load the accumulator with the address of the buffer containing the information to be transferred minus one. This instruction is executed within LDINFO, and subsequently the return address of LDINFO is incremented.

E. JOBTLE. Called if no job separator record is encountered before the print data is accessed. The message ENTER TAPE NUMBER: is output at the teletype via MMESSG. Then the input characters (five entries) are read and printed at the teletype. If a RUBOUT (ASCII 377) is encountered, the routine branches back to its beginning; otherwise, the five entries are stored in the buffer JOBNAM. The sixth entry of JOBNAM is the current file number (in ASCII configuration

F. DFCTRL. Loads and processes the default job separator and job title information if no job separator is initially encountered at the beginning of the file. The subroutine LDINFO is used to transfer the information in SEPREC (default job title information).

G. GTBYTE. Unpacks the 16 least significant bits of a word into two eight-bit bytes. The left-most byte is returned in accumulator on the first call and the right-most byte is returned on the second call, etc. MTPTR points to the word to be unpacked.

H. HEADER. Loads the appropriate X-delta, Y-delta, spot size, character size, and intensity registers, and then sets the optical hardware via SETPLS.

I. NEXPAG. Finishes the current page by flashing the forms (if any) via PPAGE and FRFLAS, advances to the next frame (or fiche when necessary) by calling NEXPIC, and initializes for the next page with the routines TOPPAG and HEADER.

J. TOPPAG. Resets the line count (LNCNT), resets the X and Y DAC's to the beginning position for a page, and calls IXPAGE to initialize for indexing this page.

K. FRFLAS. Flashes the overall form if one has been loaded.

L. PPAGE. Flashes the error form (if one) and other forms (if any) if FLASSW is set to a NOP. If FLASSW is a SKP, no forms will output.

M. IXCHCK. Used only when processing with TERMINAL carriage controls. This routine checks IXLDSW to set if this page has been indexed. If so, the subroutine exits. Otherwise, the current line count is checked for being the index line. If it isn't, IXSW is changed to a SKP to prevent storage of the bytes in TITARE, and the routine exits. If the current line is the index line, IXSW is changed to a NOP so that the non-carriage control bytes will be stored in TITARE.

N. THISLN. Called when the carriage control is to overprint the next line. The index line count (INDXER) is incremented and then checked for being zero. If it is, the line just filmed contains the index information and is transferred to TITARE by IXLOAD. Otherwise, the index line count is restored. Then the X DAC is repositioned to the beginning of the current line, and BMSTLL allows the DAC's to settle before returning to the main loop.

O. NEXTLN. Called when the carriage control is a single space. The index line count (INDXER) is incremented and checked for being zero. If it is, the record just filmed is loaded into TITARE and processed by IXLOAD. Then the page line number (LNCNT) is incremented and checked for being zero. If it is, the page is full and the routine branches to NUPAGE where NXPAGE is called. If LNCNT is not zero, CRT is executed and BMSTLL is called to allow the DAC's time to settle before processing the next line.

P. NXPAGE. First checks IXLDSW to see if the current page has been indexed. If not, the blank-filled area of TITARE is processed as the index information by INXDO. Then FLASSW is changed to a NOP to allow forms to be flashed and NEXPAG is called. KYBLIS checks for interrupts before exiting NXPAGE.

Q. GTCTRL. Decodes the VORTEX carriage control bytes. The word from the tape buffer with the carriage control in the left-most byte should be in the accumulator prior to entering GTCTRL. The contents of the accumulator are shifted right eight bits and the six least significant bits are masked off and retained. A result of 61 causes the program to branch to NXPG, where the subroutine NXPAGE is called. If the result is 53, the program branches to SAMLIN and then calls THISLN. If the carriage control is a 60, 2SPACE is called to space down the first line (in case of indexing on the blank line) and then NEXTLN is called. Any other code results in NEXTLN being called.

R. 2SPACE. First calls NEXTLN, then the line number of the line to be left blank is checked for being the index line. If it is, the blank-filled area of TITARE is processed as the index information for this page by IX.DO.

S. BMSTLL. Allows a delay of 120 cycles.

T. CTRLCK. Calls MTLAC to read the next record and retrieve the first word from the current tape buffer. Then the 2's complement characters/line count (SAVCNT) is computed. The first byte of this record is then checked for being a 245, indicating a fiche control record. If it isn't, the program returns to the print loop where the record is output. Otherwise, the second byte is then checked. An S record is processed at SREC, where JOBTLE and S.FLAG are set to indicate the tape ID information came from a control record, and then the program goes to CREC where the record, beginning with the 2nd byte, is stored into TITARE and decoded by FICTAP. F, T, C, or B records are processed at CREC. Then the program returns to the beginning of CTRLCK where MTLAC reads the next record. (If a control record is not one of the above type records, the program returns to the print loop where the record is output.)

2.4.3.3 Constants and Variables

A. Internal

1. SAVCNT. Contains the 2's complement number of characters to be output in the current line, computed by doubling the number of words (MTCNT) in the record just read. If processing with VORTEX controls, the carriage control byte is compensated for by adding one.

2. NEXBUF. Contains the address of the buffer to be used during the next tape read.

3. SAVICT. Contains the number of characters to be output in the current line (2's complement of SAVCNT).

4. IXXXX. Index line number, used only with terminal controls. A different scheme for indexing must be used since a line may consist of more than one record.

5. IXLCNT. SAVCNT for the previous read; the count used for moving the record into TITARE.

6. IXCNT. Character count for a line, used when processing with terminal controls for counting characters in a line that may be more than one record in length.

7. TMPCT. A multi-purpose variable.

8. INDXER. The 2's complement of the index line number.

9. CURBUF. Contains the address of the current tape buffer.

10. SV. Contains the first carriage control byte of a job (when processing with VORTEX controls).

11. LNCNT. Currently contains the 2's complement of the line's per page minus the current line number.

12. TEMP. Multipurpose location.

13. VCHYI. Contains the beginning Y coordinate for a page

14. GTSAVE. Contains the word from the tape buffer currently being unpacked by GTBYTE.

15. TNMBR. Counter used for reading teletype entries in JOBTLE.

16. NTREE. Contains the current entry from the teletype.

17. IXLINE. Default index line number (= 1).

18. IXSTRT. Default beginning index character number (= 32).

19. IXLONG. Default length of the index field (= 20).

20. SEPREC. Name for buffer containing the default job separator information.

21. JOBNAM. Name of buffer within SEPREC which contains the information input by operator as the first five entries, and the file number in ASCII as the sixth.

22. TLEREC. Name of the buffer containing the default title record information.

23. IXSW. If NOP, allows storing of index information into TITARE; used only if processing with terminal controls.

24. IXLDSW. If NOP, indicates that index information has not been encountered. IXLDSW is changed to a SKP once the information for the current page has been processed.

25. TNMMSG. Name of buffer containing the message ENTER TAPE NUMBER:.

26. ILLEGL. Name of buffer containing message INVALID ENTRY.

27. CCTYPE. Name of buffer containing the message 1=NONE, 2=VORTEX,3=TERMINAL, displayed on the monitor to explain the carriage control option.

28. XORWRD. For VORTEX carriage controls, equals 400,000; otherwise, it is zero. Used to initialize the starting address for the character generator.

29. CTRL. Contains the carriage control indicator (1 for NONE, 2 for VORTEX, or 3 for TERMINAL). This is operator-accessible via MONITOR.

30. LNS. Contains the maximum number of lines per page. The default value is 60; however, LNS is operator-accessible via MONITOR.

31. ERFLAG. Indicates an error if set to a LAM. Allows error form (if one has been loaded) to be flashed on the page.

32. ERFMFL. Contains the address of the error form if this form has been loaded.

33. FRAMFL. Contains the address of the overall form if this form has been loaded.

34. FRMNUM. Contains the number of the form to be flashed (0,1,2,3, or 4).

35. FRMTAB. Table of the addresses of the forms which have been loaded.

36. LENGTH. The 2's complement of the length of a single tape buffer.

37. BUFFER. Area reserved for the tape buffers

38. XFOFF. Contains X offset for using forms.

39. YFOFF. Contains Y offset for using forms.

40. CHRSZ. Contains character size to be used.

41. SPCNUM. Contains number of scope points to be used for a character space.

42. LNFDN. Contains number of scope points to move during a line feed.

43. BLANK. Contains tape code for a blank.

44. FORMSW. Indicates that a form has been loaded if it contains a SKP.

B. External

1. TITARE. Name of buffer where the fiche control records and index records are stored (one byte/word) before being processed.

2. INXLIN. Contains the line number of the line to used for indexing.

3. INXCHR. Contains starting character position within the line for beginning indexing.

4. IXXLEN. Contains 2's complement of the length of the index field.

5. MTPTR. Auto-index register 10, used for accessing words in the current tape buffer.

6. PBUFSZ. Contains 2's complement of the length of a tape buffer.

7. IFLASW. Allows index form and information to be output if it contains a SKP. A NOP in IFLASW prevents index output.

8. VCHTAB. Table of eight- and seven-bit ASCII character code pointers.

9. MVDATA. Used as a temporary counter location.

10. LEFTX. Contains X coordinate for the beginning of a page.

11. FILCNT. Contains 2's complement of the number of files left to be processed in the current batch.

12. FILNUM. Contains number of current file.

13. RECNUM. Contains record number of record in CURBUF.

14. CHDELX. Contains value to be loaded into X delta register.

15. CHDELY. Contains value to be loaded into Y delta register.

16. CHRSIZ. Contains value to be loaded into size register by SETPLS.

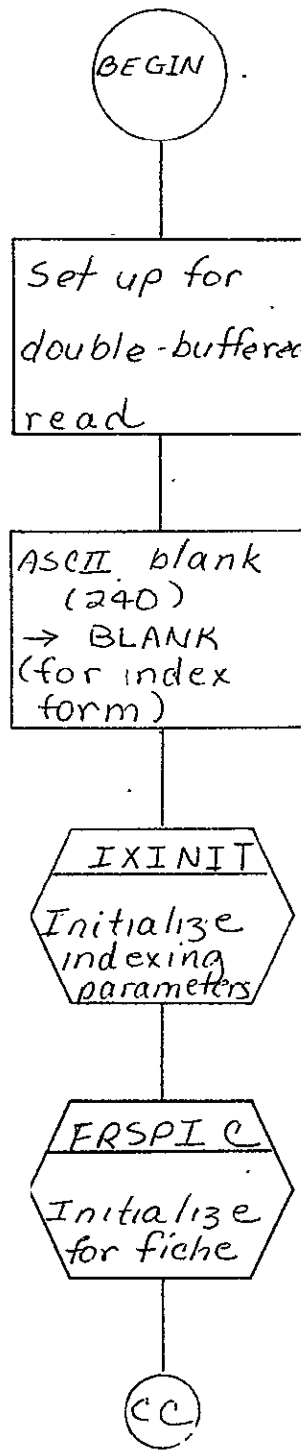
17. RECPIN. Contains value to be loaded into brightness register by SETPLS.

18. RECSPT. Contains value to be loaded into spot size register by SETPLS.

19. DECNUM. Contains decimal configuration of the number after GETNUM is called. If no number is found by GETNUM, DECNUM contains a LAM.

20. MTCNT. Contains 2's complement number of words read into the tape buffer.

2.4.3.4 Flow Charts. See following pages.



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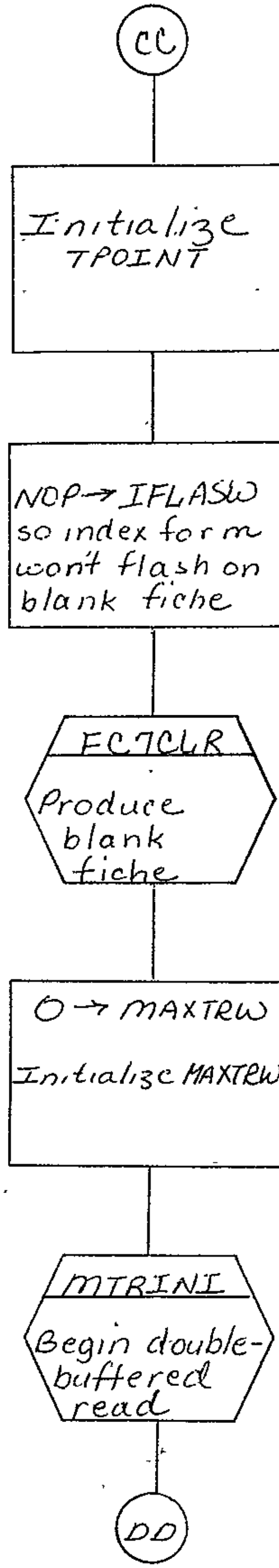
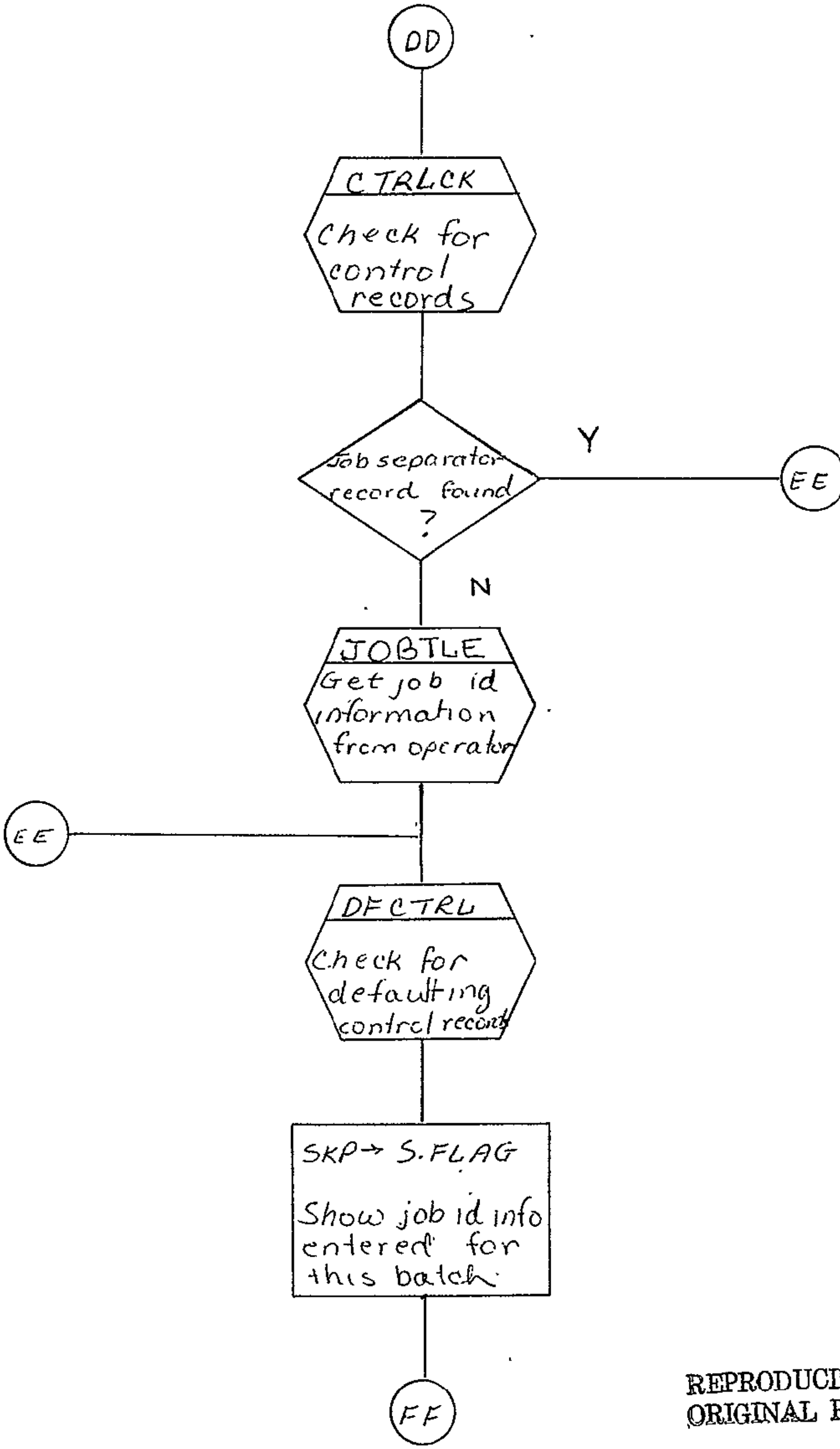
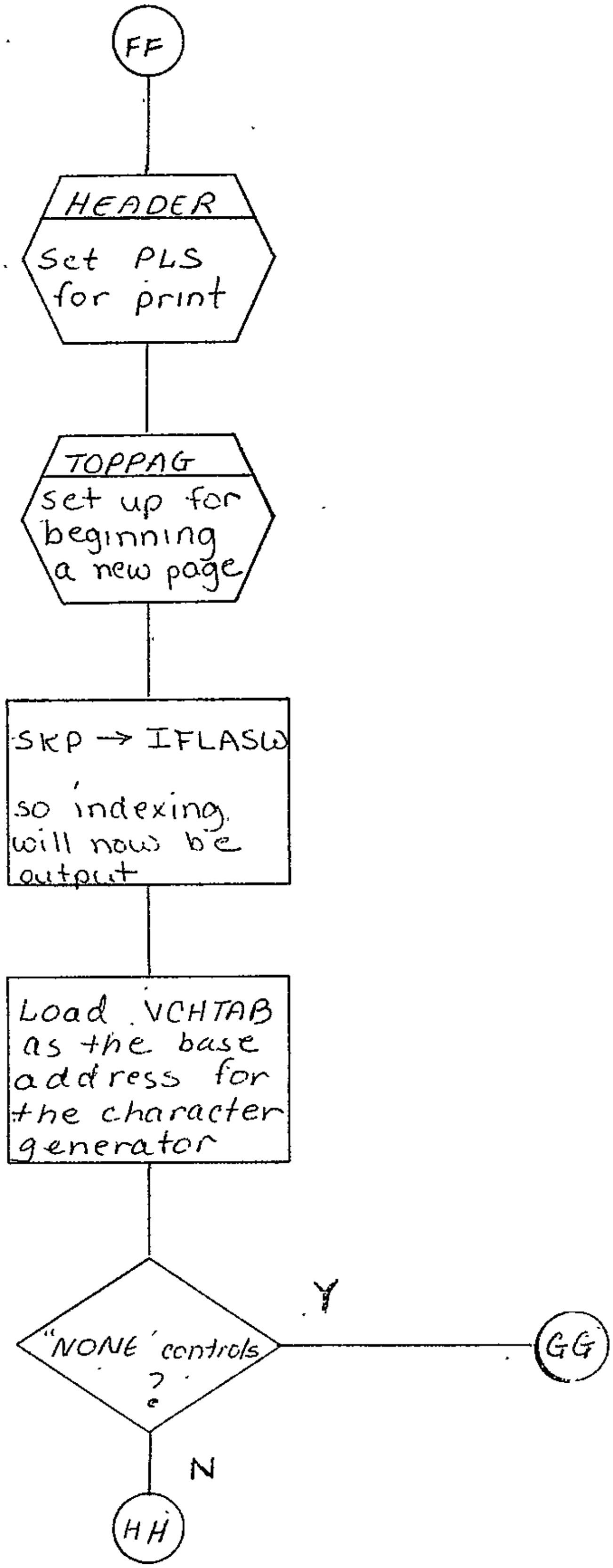
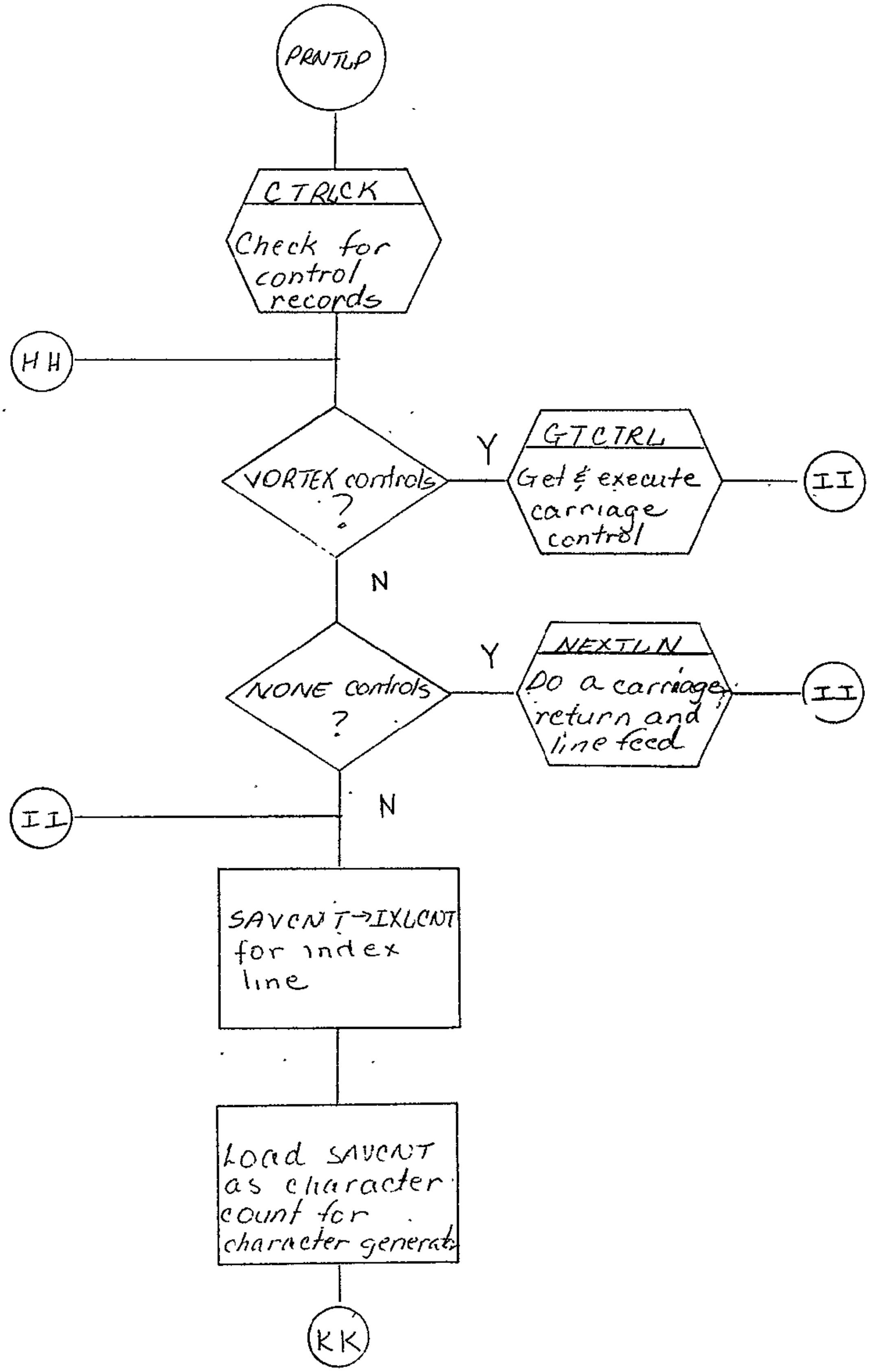
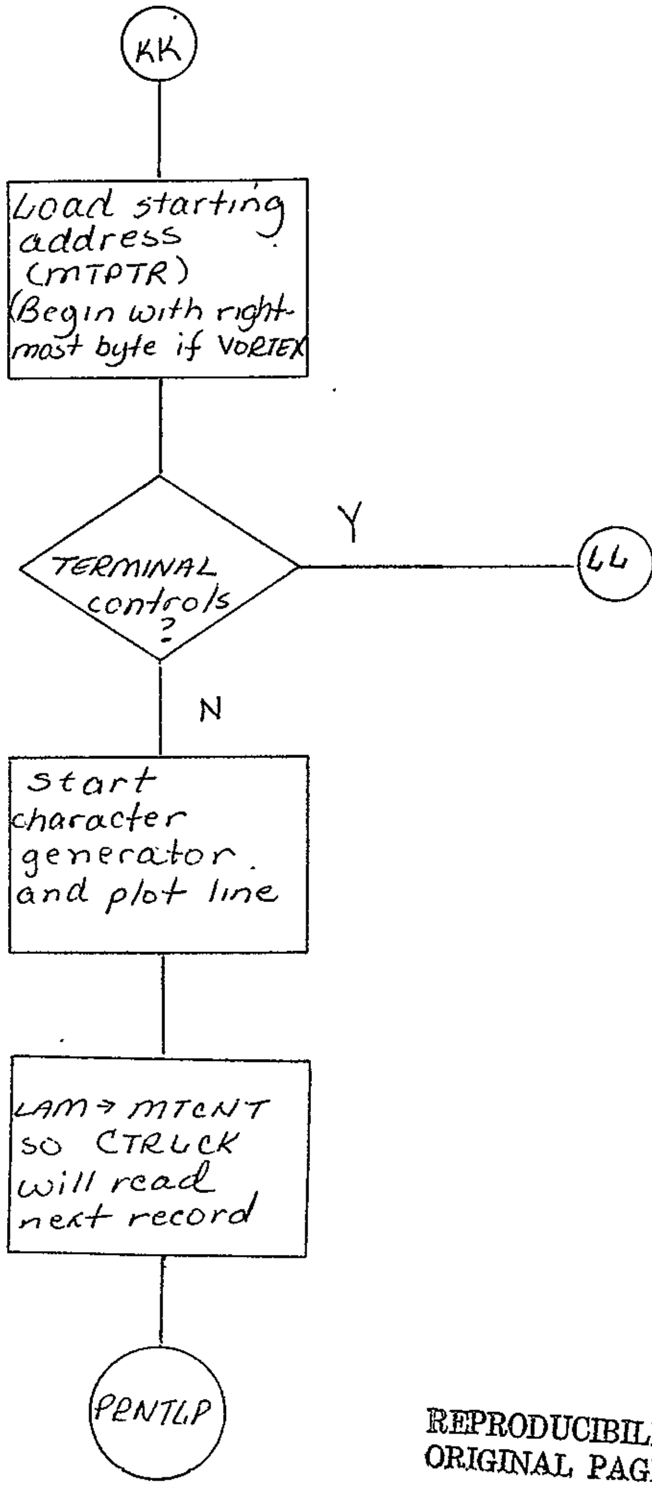
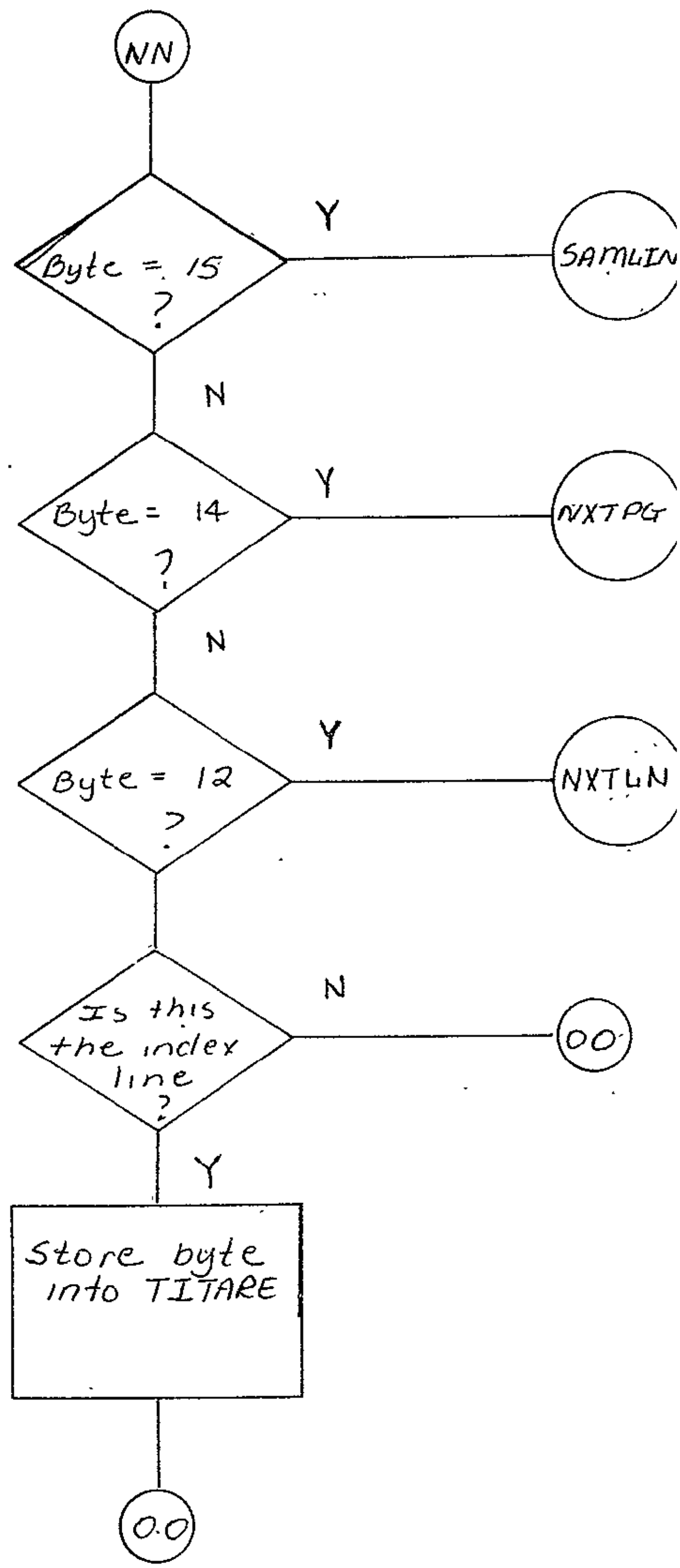

CC
Initialize TPOINT
NOP → IFLASW so index form won't flash on blank fiche
FC7CLR
Produce blank fiche
0 → MAXTRW
Initialize MAXTRW
MTRINI
Begin double-buffered read
DD

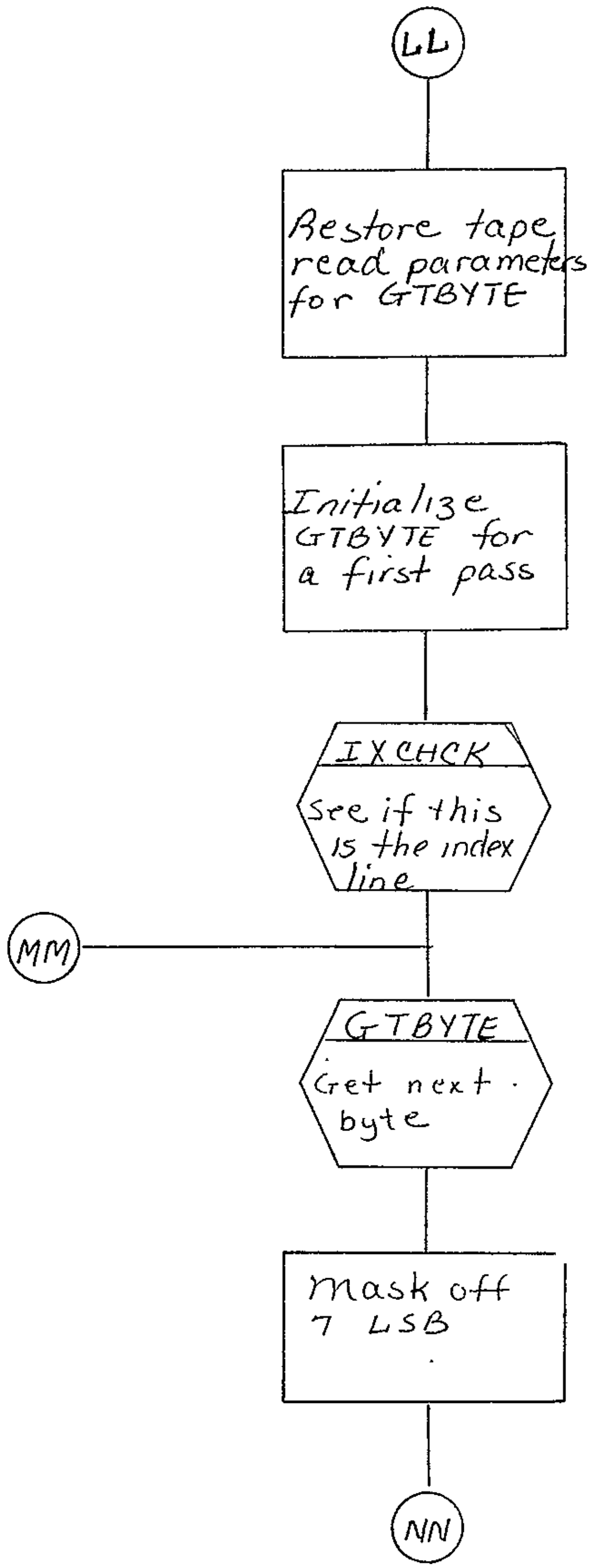

DD
CTRLCK
Check for control records
Job separator record found ?
Y
EE
N
JOBTLE
Get job id information from operator
EE
DFCTRL
Check for defaulting control records
SKP → S.FLAG
Show job id info entered for this batch
FF

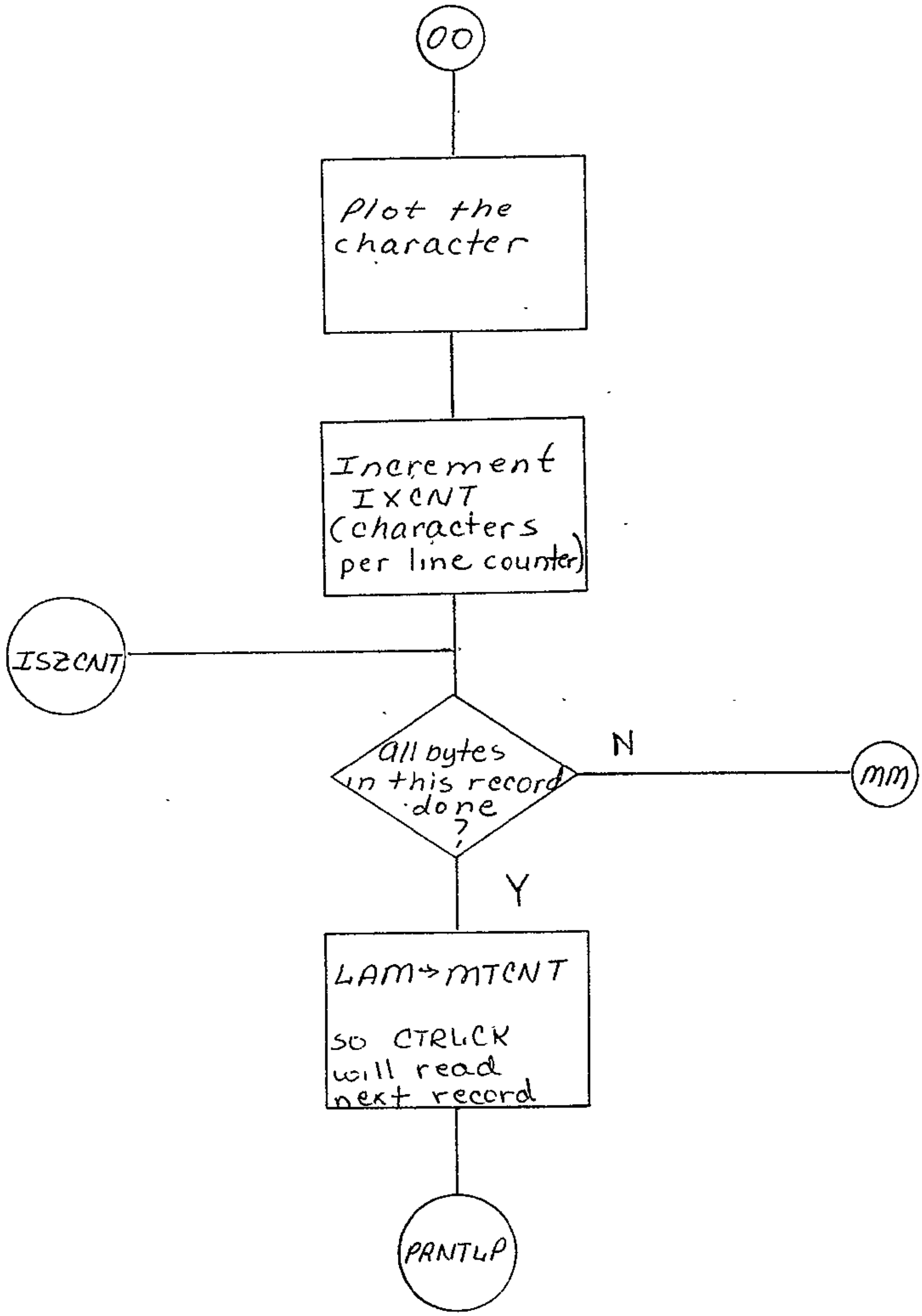

FF
HEADER
Set PLS for print
TOPPAG
set up for beginning a new page
SKP → IFLASW
so indexing will now be output
Load VCHTAB as the base address for the character generator
"NONE" controls ?
Y
GG
N
HH

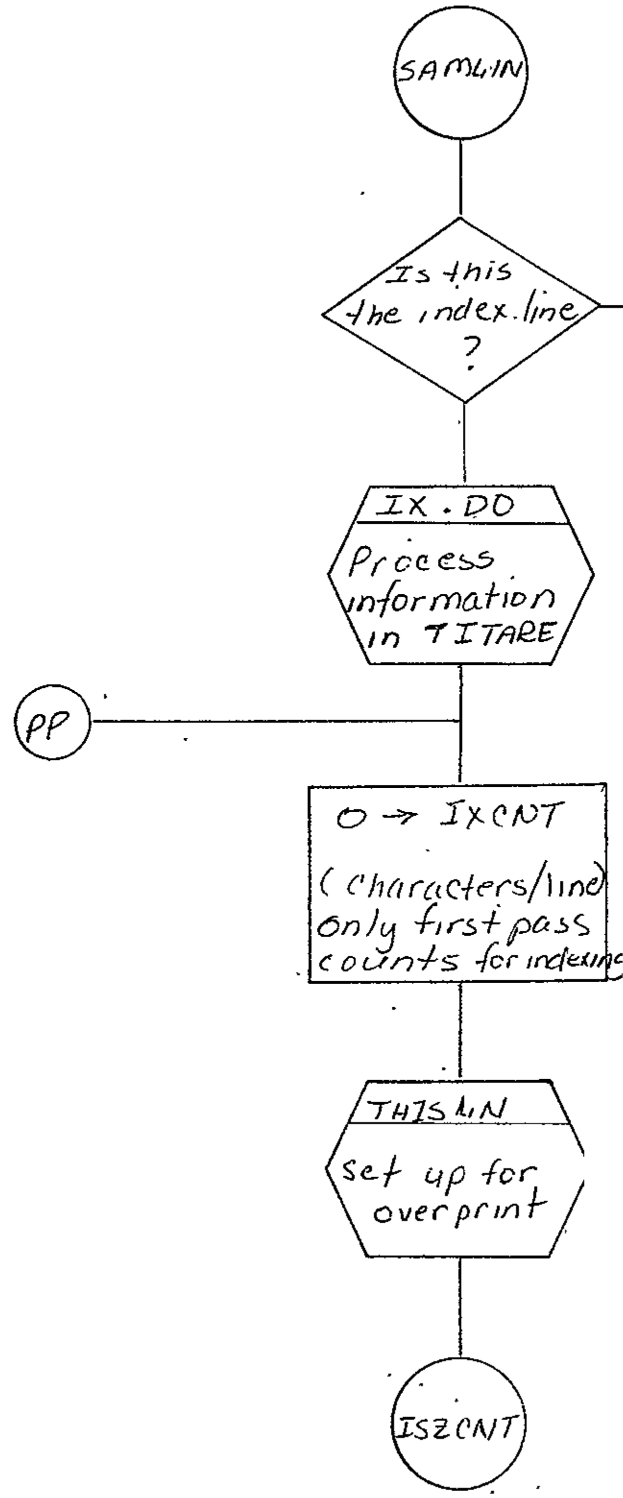

PRNTLP
CTRLCK
Check for control records
HH
VORTEX controls ?
Y
GTCTRL
Get & execute carriage control
II
N
NONE controls ?
Y
NEXTLN
Do a carriage return and line feed
II
II
N
SAVCNT→IXLCNT for index line
Load SAVCNT as character count for character generat.
KK

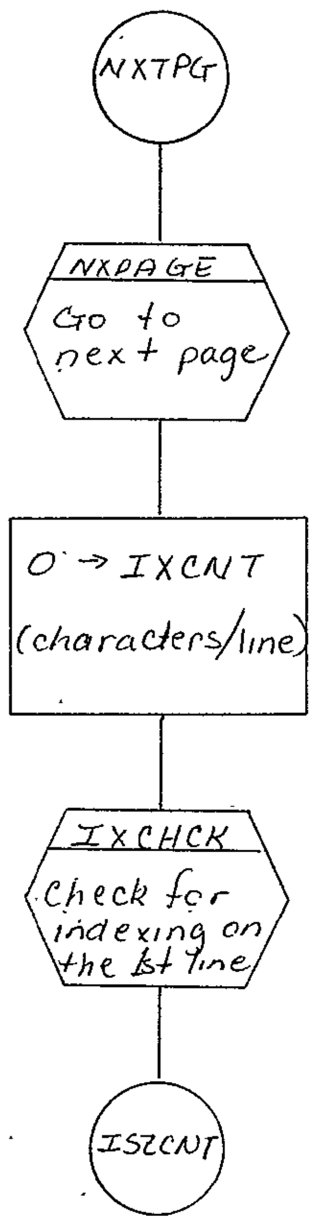

KK
Load starting address (MTPTR) (Begin with right-most byte if VORTEX
TERMINAL controls ?
Y
LL
N
start character generator and plot line
LAM → MTCNT so CTRUCK will read next record
PENTLP

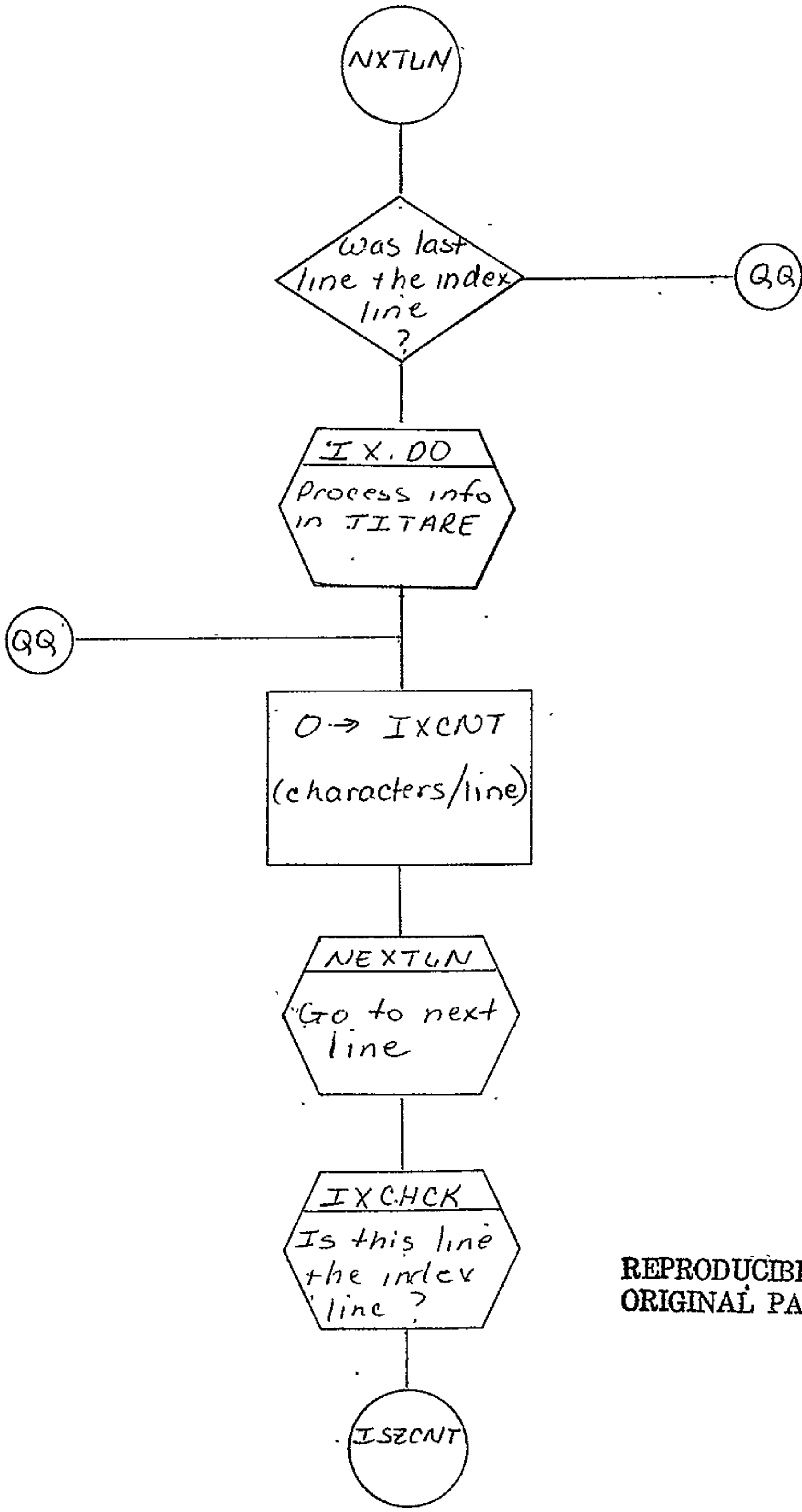

NN
Byte = 15 ?
Y
SAMLIN
N
Byte = 14 ?
Y
NXTPG
N
Byte = 12 ?
Y
NXTLN
Is this the index line ?
N
00
Y
Store byte into TITARE
0.0


LL
Restore tape read parameters for GTBYTE
Initialize GTBYTE for a first pass
IXCHCK
See if this is the index line
MM
GTBYTE
Get next byte
Mask off 7 LSB
NN


OO
Plot the character
Increment IXCNT (characters per line counter)
ISZCNT
all bytes in this record done ?
N
MM
Y
LAM→MTCNT
so CTRLCK will read next record
PRNTLP


SAMLIN
Is this the index.line ?
N
PP
IX.DO
Process information in TITARE
PP
0 → IXCNT
(characters/line) only first pass counts for indexing
THISLIN
set up for overprint
ISZCNT


NXTPG
NXPAGE
Go to next page
0 → IXCNT
(characters/line)
IXCHCK
Check for indexing on the 1st line
ISZCNT



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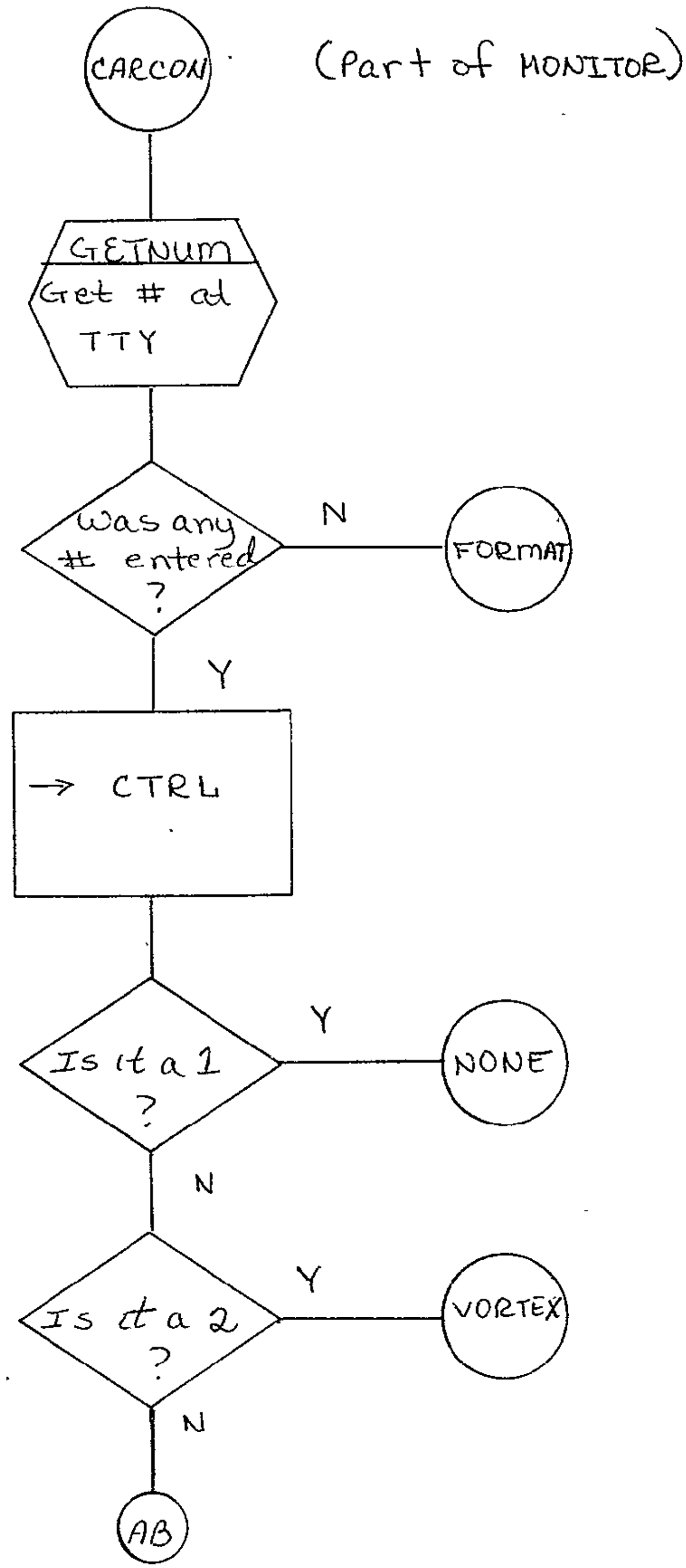
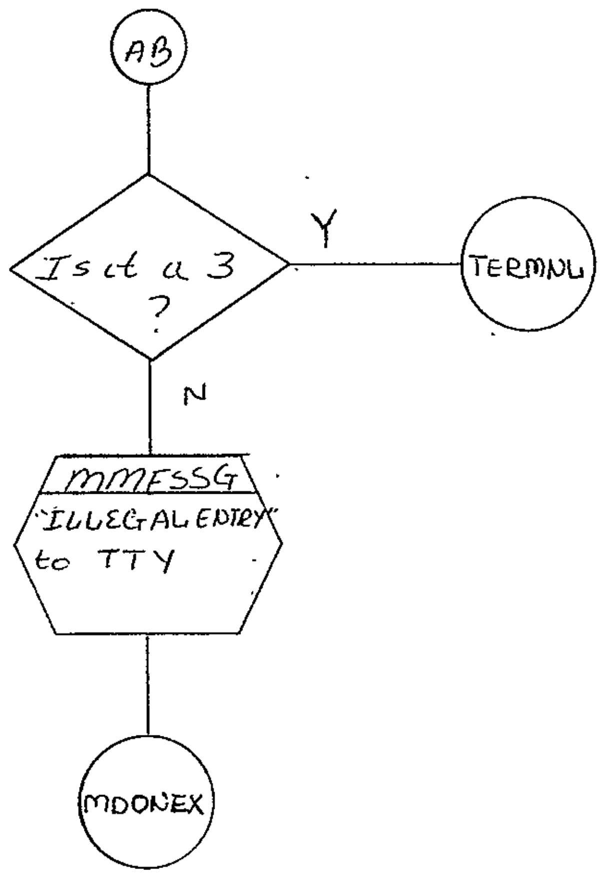
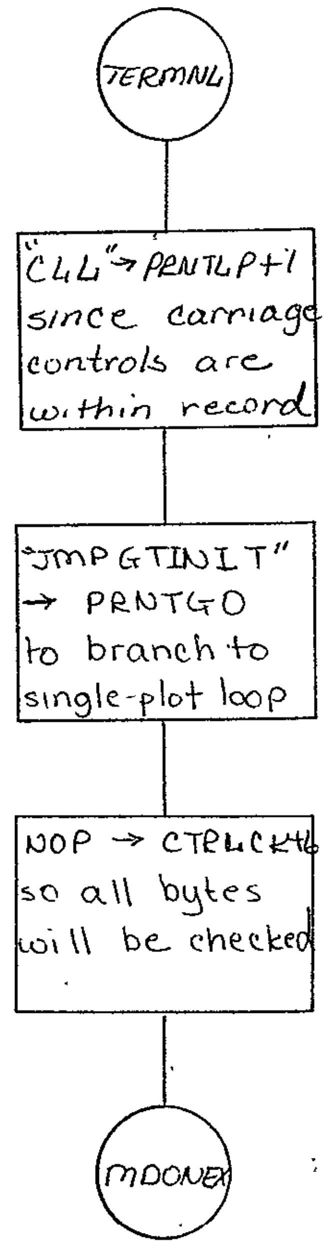
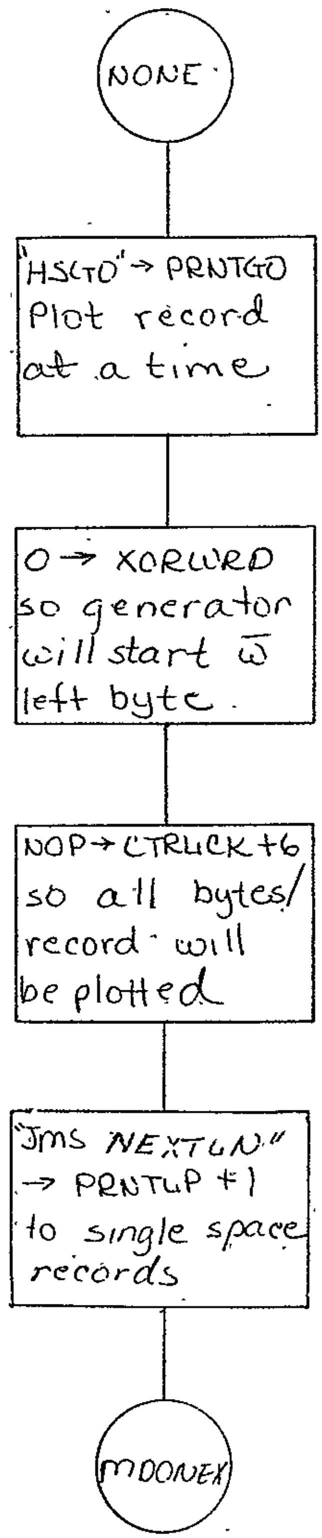
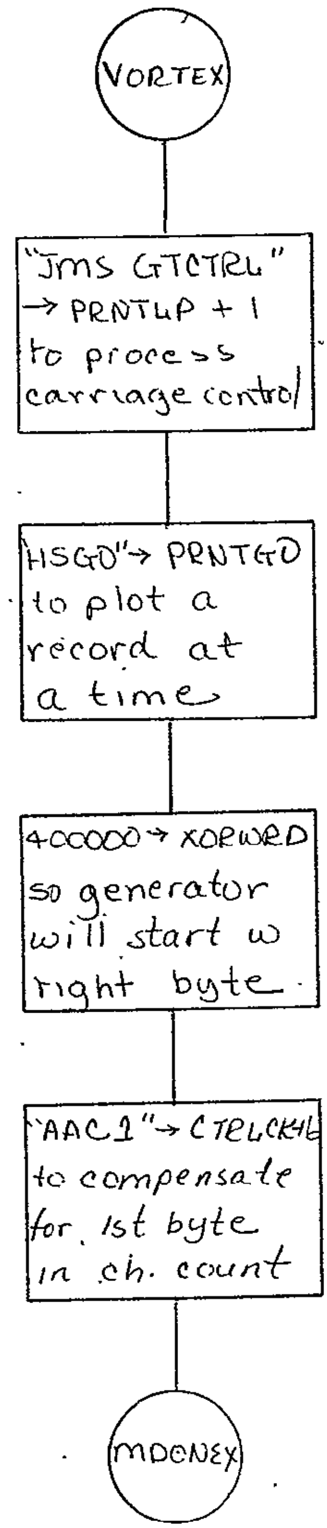
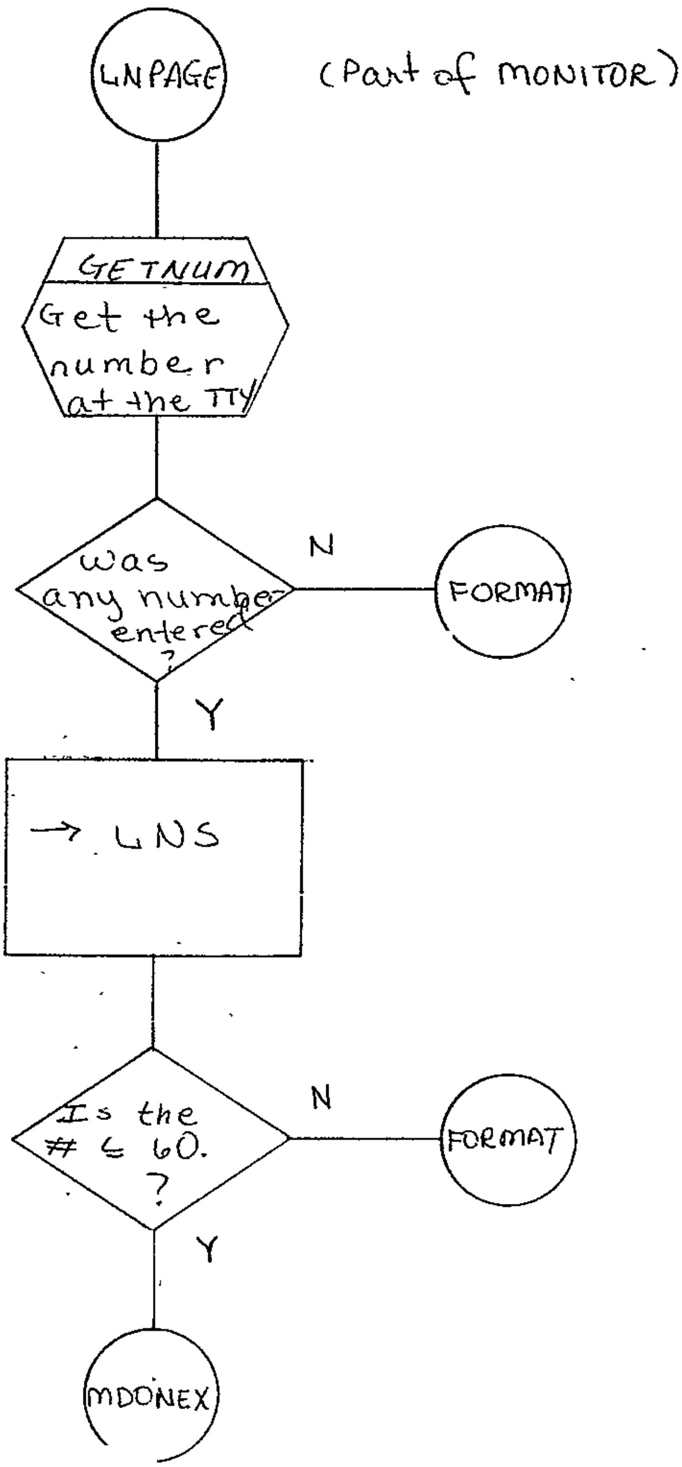

CARCON
(Part of MONITOR)
GETNUM
Get # at TTY
Was any # entered ?
N
FORMAT
Y
→ CTRL
Is it a 1 ?
Y
NONE
N
Is it a 2 ?
Y
VORTEX
N
AB

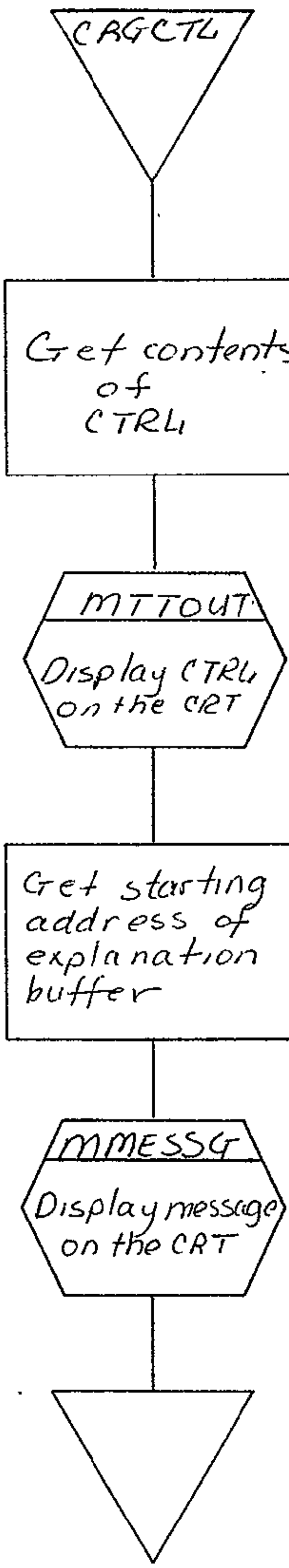

AB
Is it a 3 ?
Y
TERMNL
N
MMESSG
"ILLEGAL ENTRY"
to TTY
MDONEX

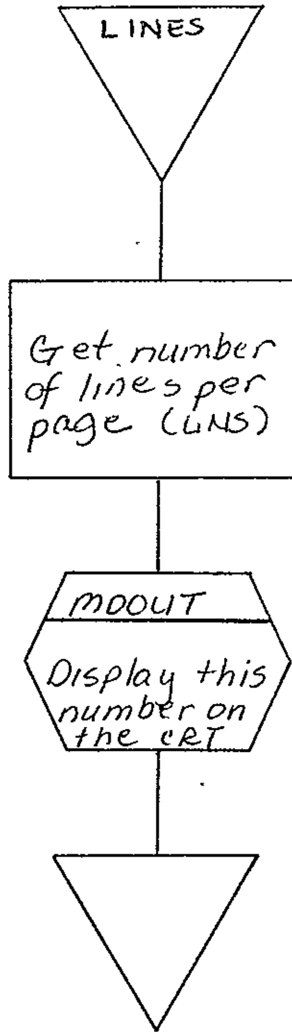

TERMNL
"CLL" → PRNTLP+1
since carriage
controls are
within record
"JMPGTINIT"
→ PRNTGO
to branch to
single-plot loop
NOP → CTRLCK46
so all bytes
will be checked
MDONEX

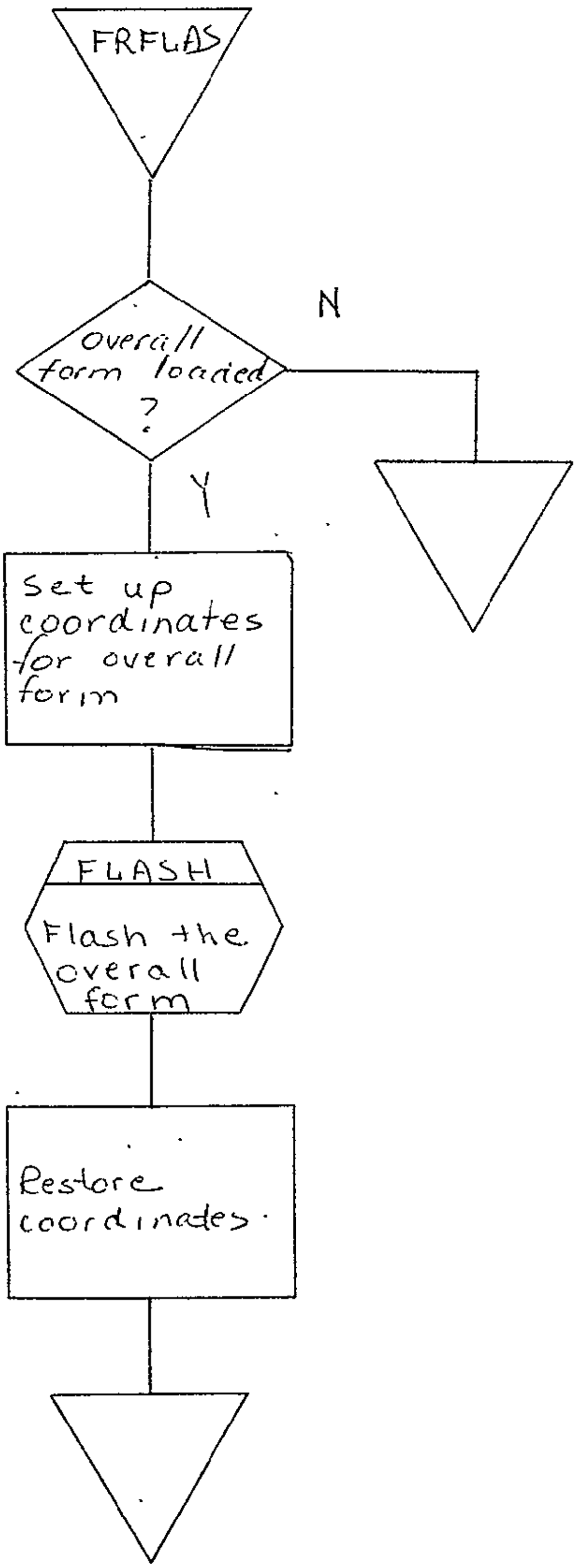

NONE
"HSGO" → PRNTGO
Plot record
at a time
0 → XORWRD
so generator
will start $\overline{w}$
left byte.
NOP → CTRUCK+6
so all bytes/
record will
be plotted
"JMS NEXTLN"
→ PRNTLP +1
to single space
records
MDONEX

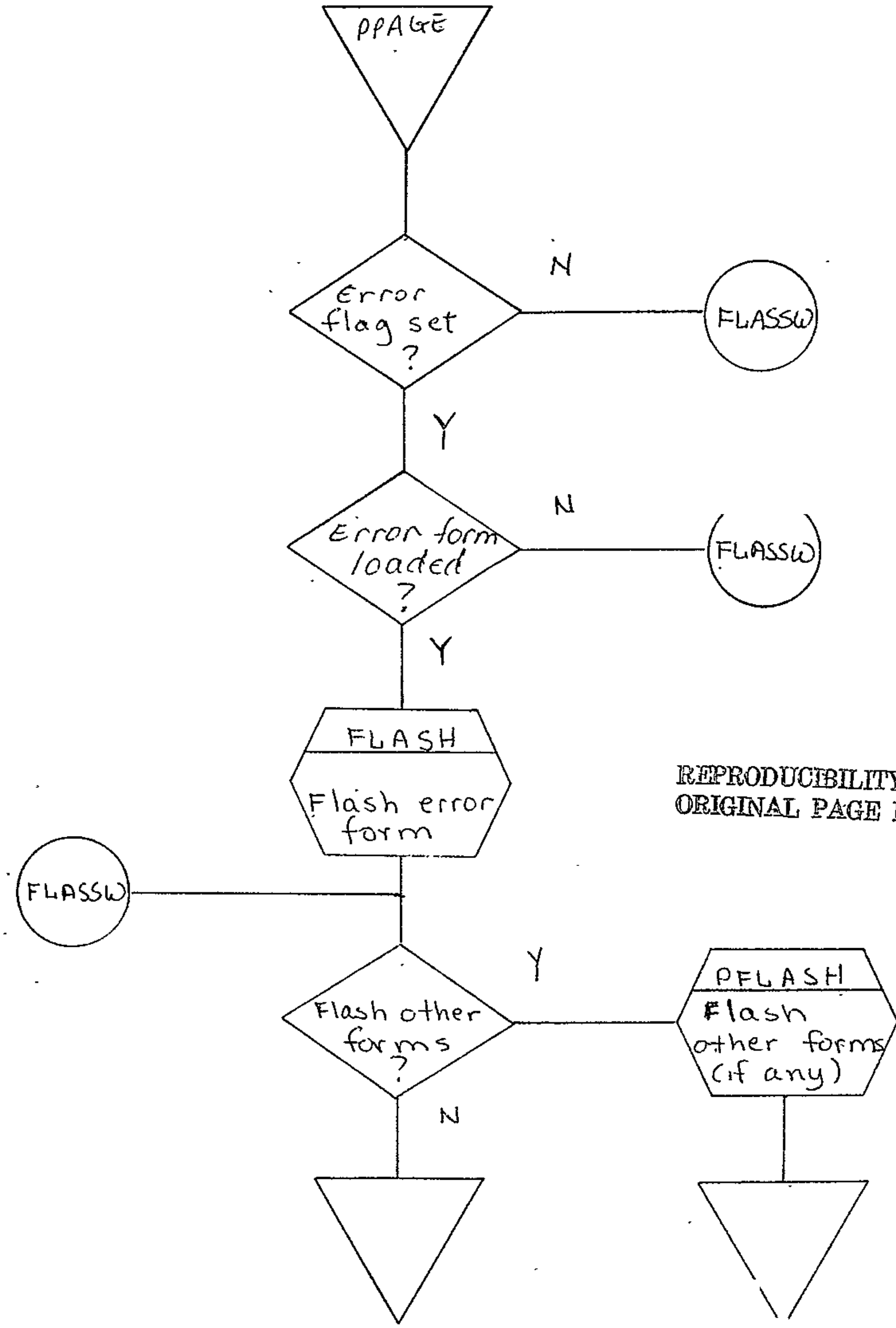

VORTEX
"JMS GTCTRL" → PRNTLP + 1 to process carriage control
"HSGO" → PRNTGO to plot a record at a time
400000 → XORWRD so generator will start w right byte.
"AAC1" → CTRLCKHL to compensate for 1st byte in ch. count
MDONEX

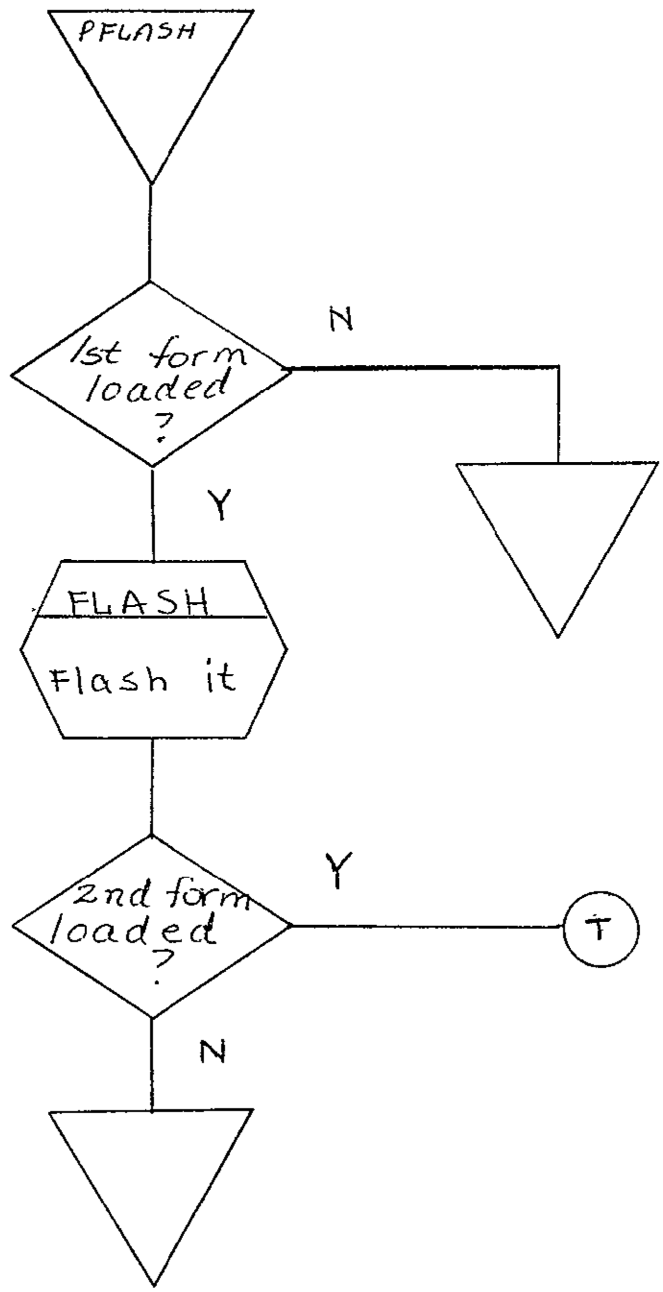

LNPAGE
(Part of MONITOR)
GETNUM
Get the number at the TTY
Was any number entered ?
N
FORMAT
Y
→ LNS
Is the # ≤ 60. ?
N
FORMAT
Y
MDONEX

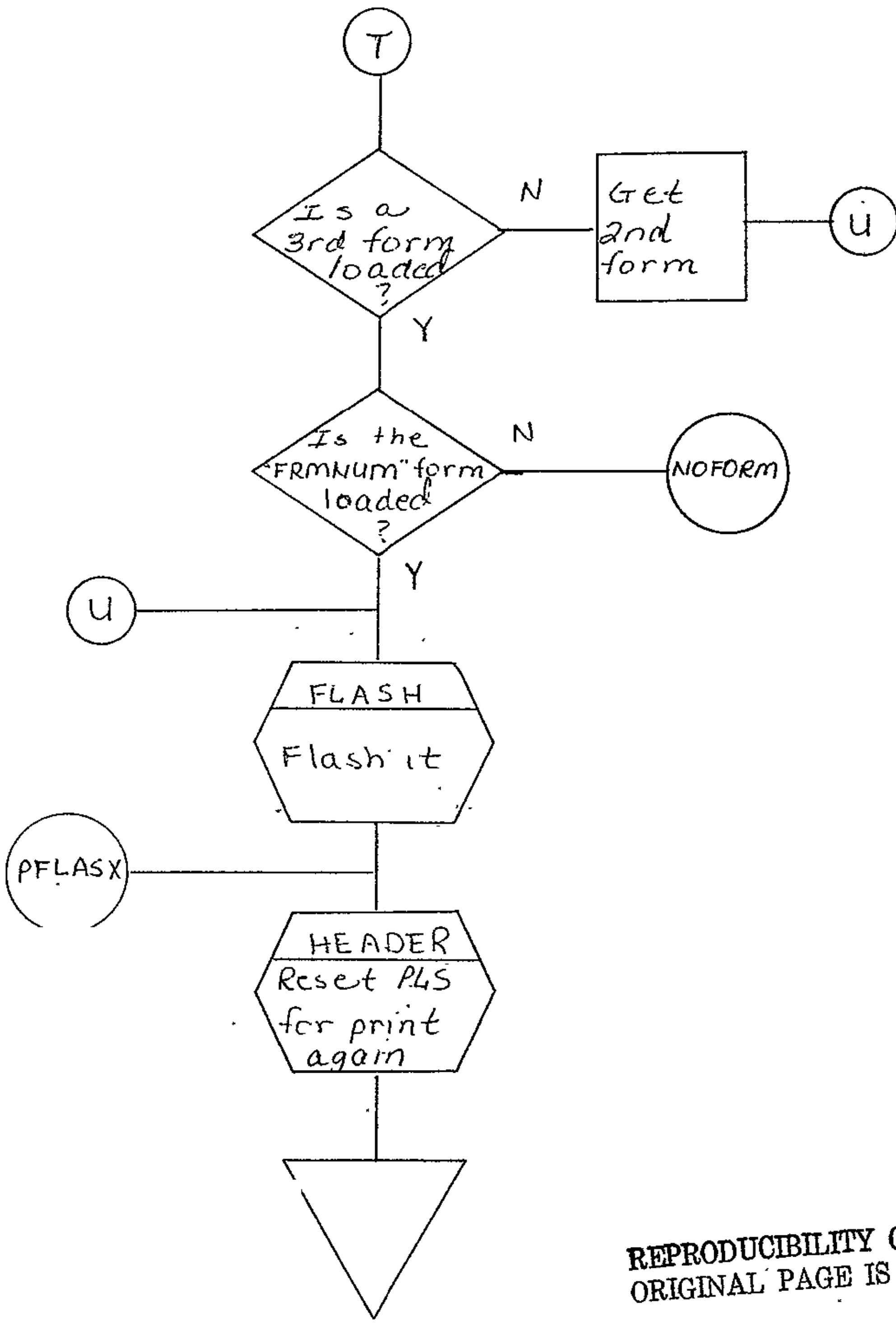

CRGCTL
Get contents of CTRL
MTTOUT
Display CTRL on the CRT
Get starting address of explanation buffer
MMESSG
Display message on the CRT

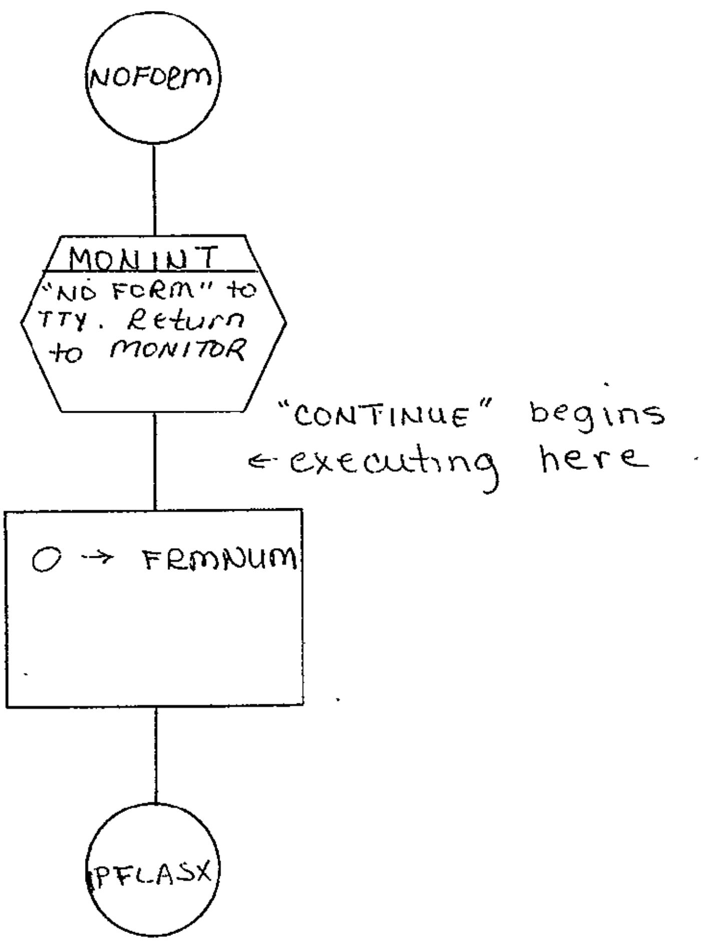

LINES
Get number of lines per page (LINS)
MDOUT
Display this number on the CRT

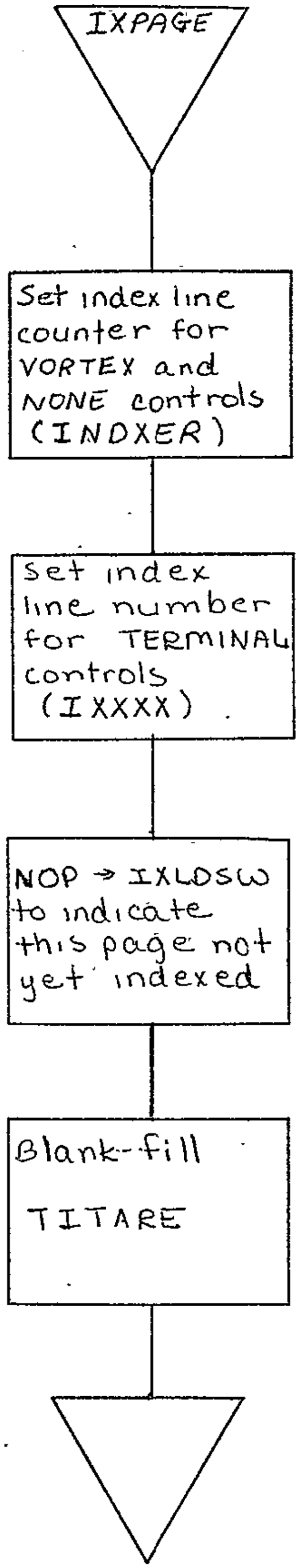

FRFLAS
Overall form loaded ?
N
Y
Set up coordinates for overall form
FLASH
Flash the overall form
Restore coordinates.

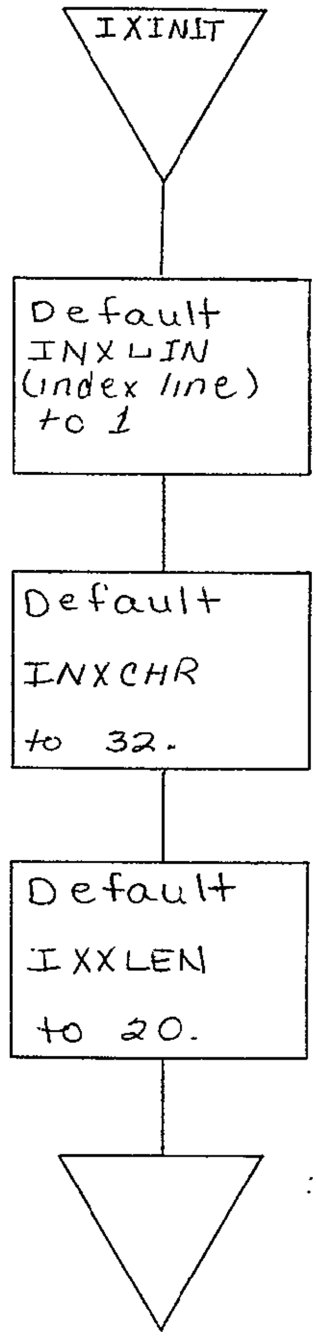

PPAGE
Error flag set ?
N
FLASSW
Y
Error form loaded ?
N
FLASSW
Y
FLASH
Flash error form
FLASSW
Y
PFLASH
Flash other forms (if any)
Flash other forms ?
N

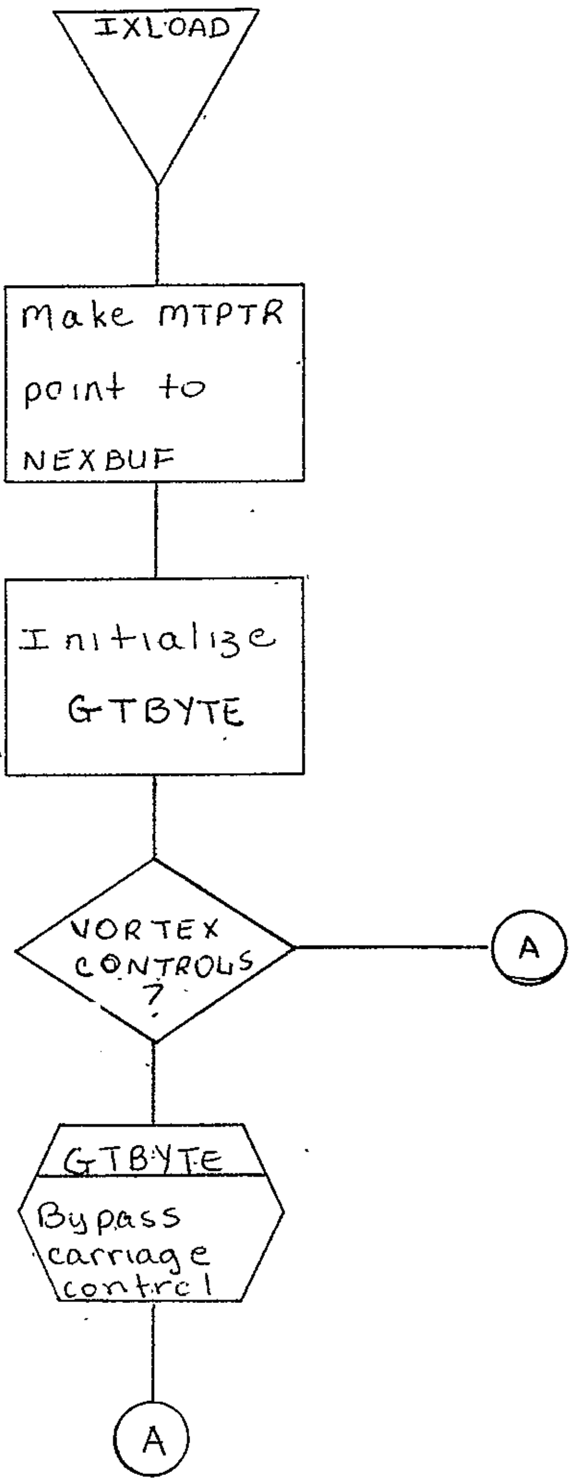

PFLASH
1st form loaded ?
N
Y
FLASH
Flash it
2nd form loaded ?
Y
T
N


T
Is a 3rd form loaded ?
N
Get 2nd form
U
Y
Is the "FRMNUM" form loaded ?
N
NOFORM
Y
U
FLASH
Flash it
PFLASX
HEADER
Reset PLS for print again

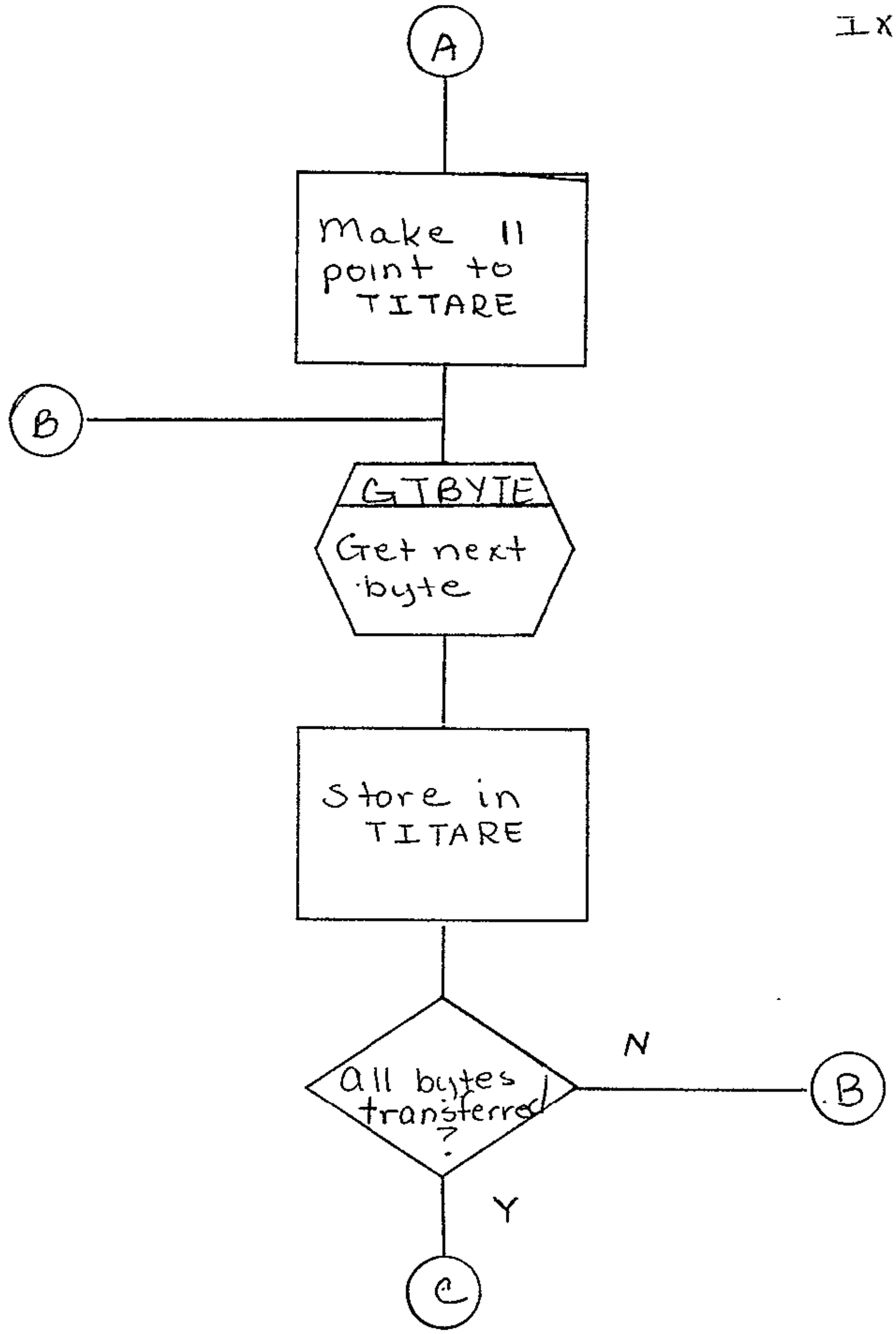

NOFORM
MONINT
"NO FORM" to TTY. Return to MONITOR
"CONTINUE" begins executing here
0 → FRMNUM
PFLASX


IXPAGE
Set index line counter for VORTEX and NONE controls (INDXER)
set index line number for TERMINAL controls (IXXXX)
NOP → IXLOSW to indicate this page not yet indexed
Blank-fill TITARE

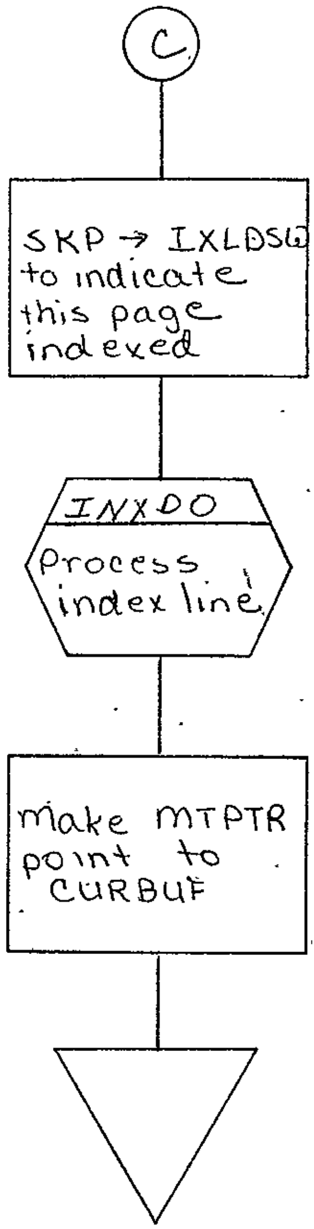

IXINIT
Default INXLIN (index line) to 1
Default INXCHR to 32.
Default IXXLEN to 20.


IXLOAD
Make MTPTR point to NEXBUF
Initialize GTBYTE
VORTEX CONTROLS ?
A
GTBYTE
Bypass carriage control
A

IXLOAD


A
Make I1 point to TITARE
B
GTBYTE
Get next byte
Store in TITARE
All bytes transferred ?
N
B
Y
C

IXLOAD



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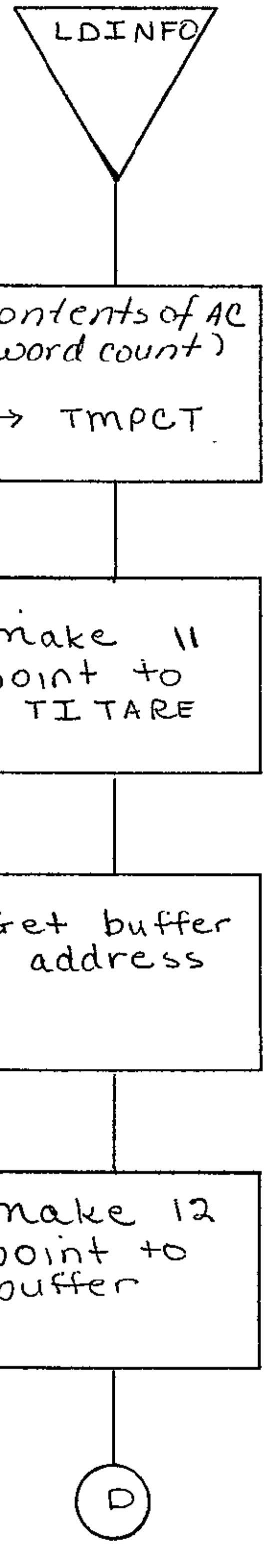
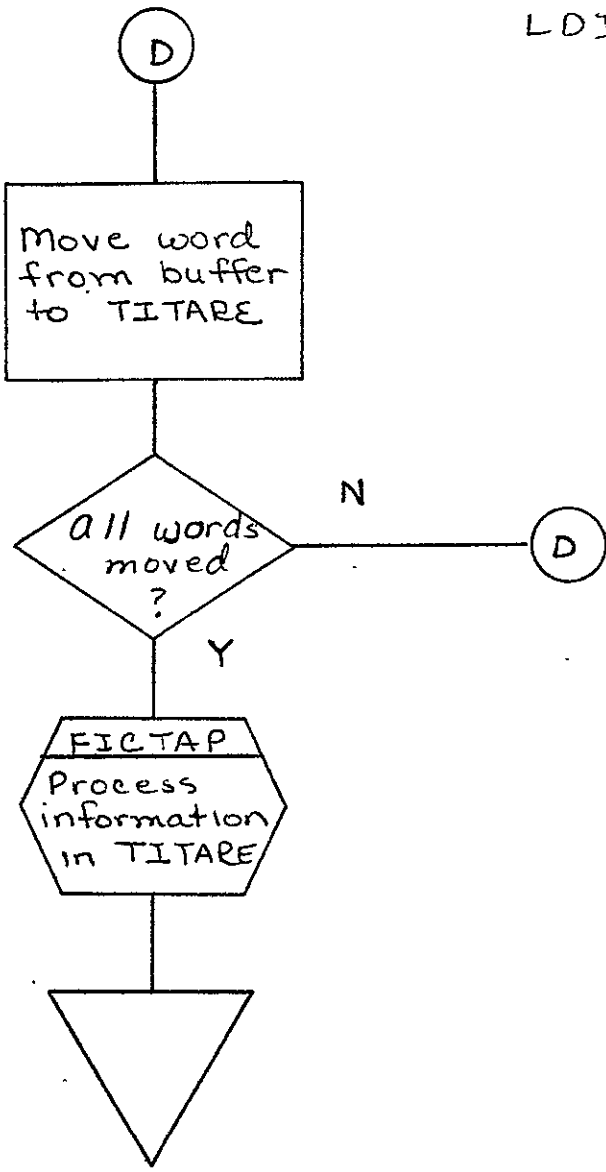
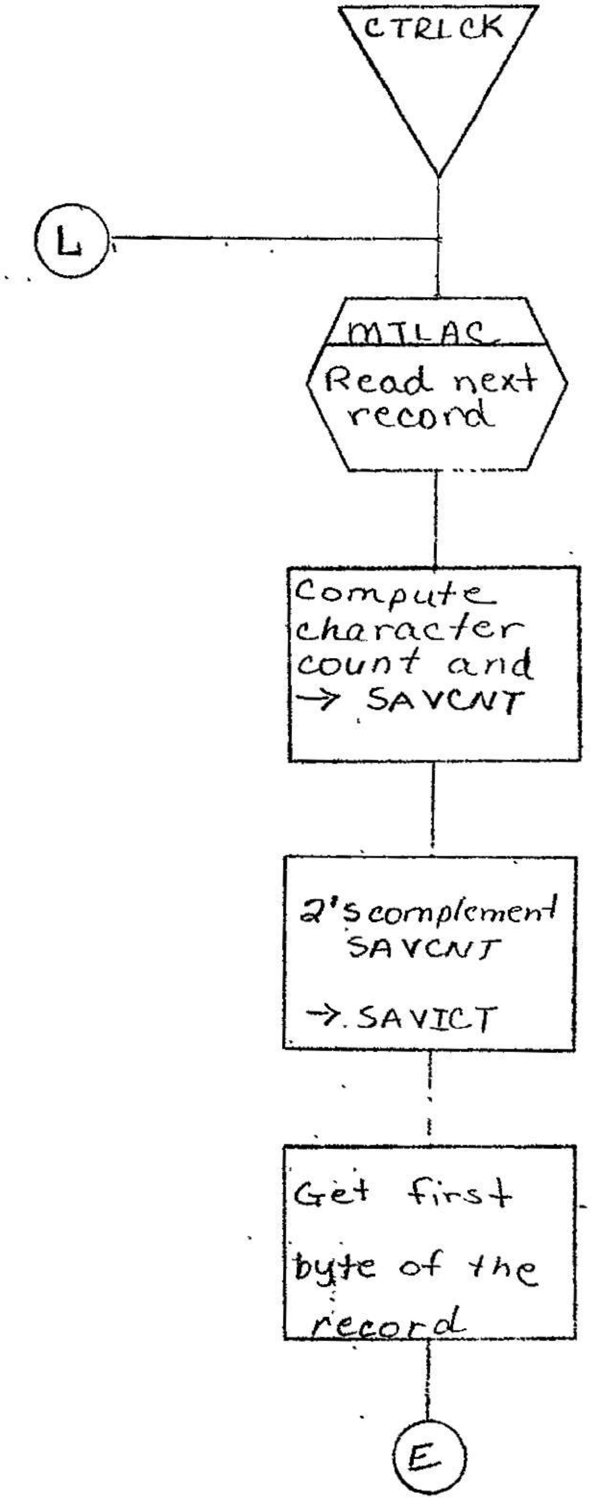
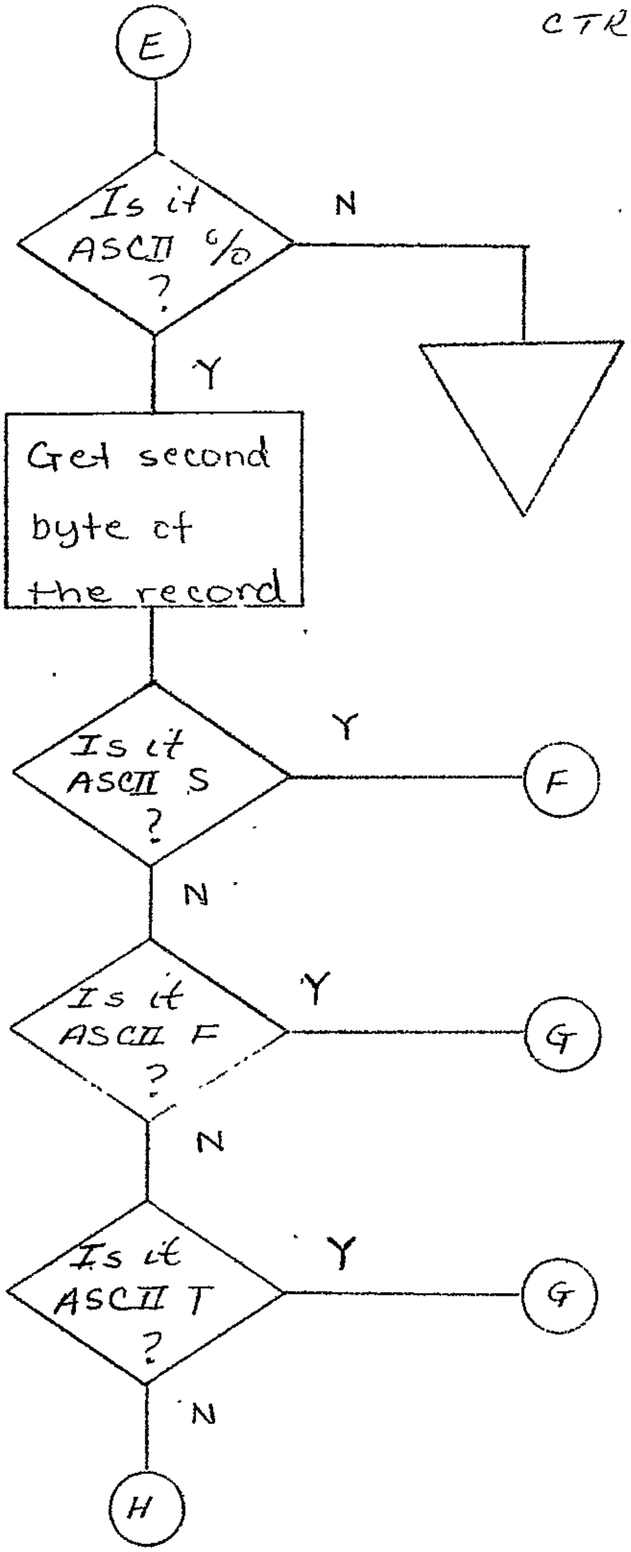

LDINFO
contents of AC (word count)
→ TMPCT
make 11 point to TITARE
Get buffer address
make 12 point to buffer
D

LDINFO

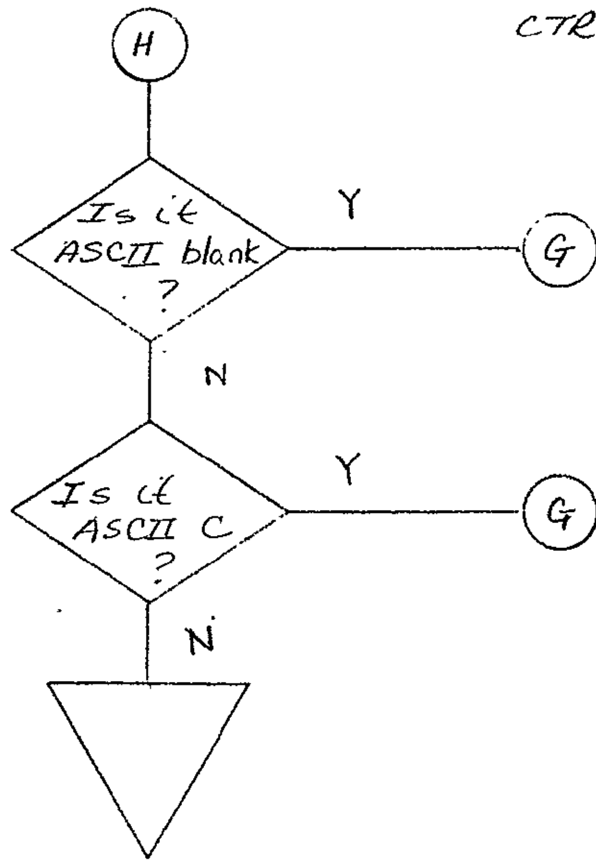

D
Move word from buffer to TITARE
all words moved ?
N
D
Y
FICTAP
Process information in TITARE

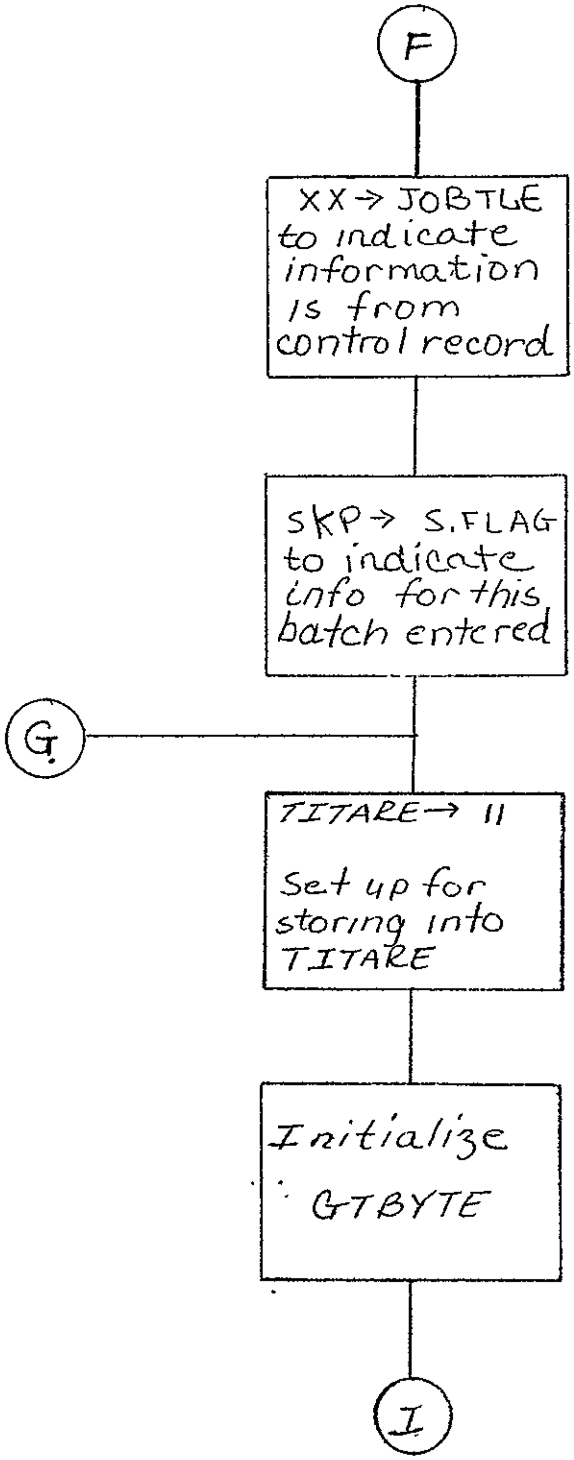

CTRLCK
L
MILAC
Read next record
Compute character count and → SAVCNT
2's complement SAVCNT
→ SAVICT
Get first byte of the record
E

CTRLCK

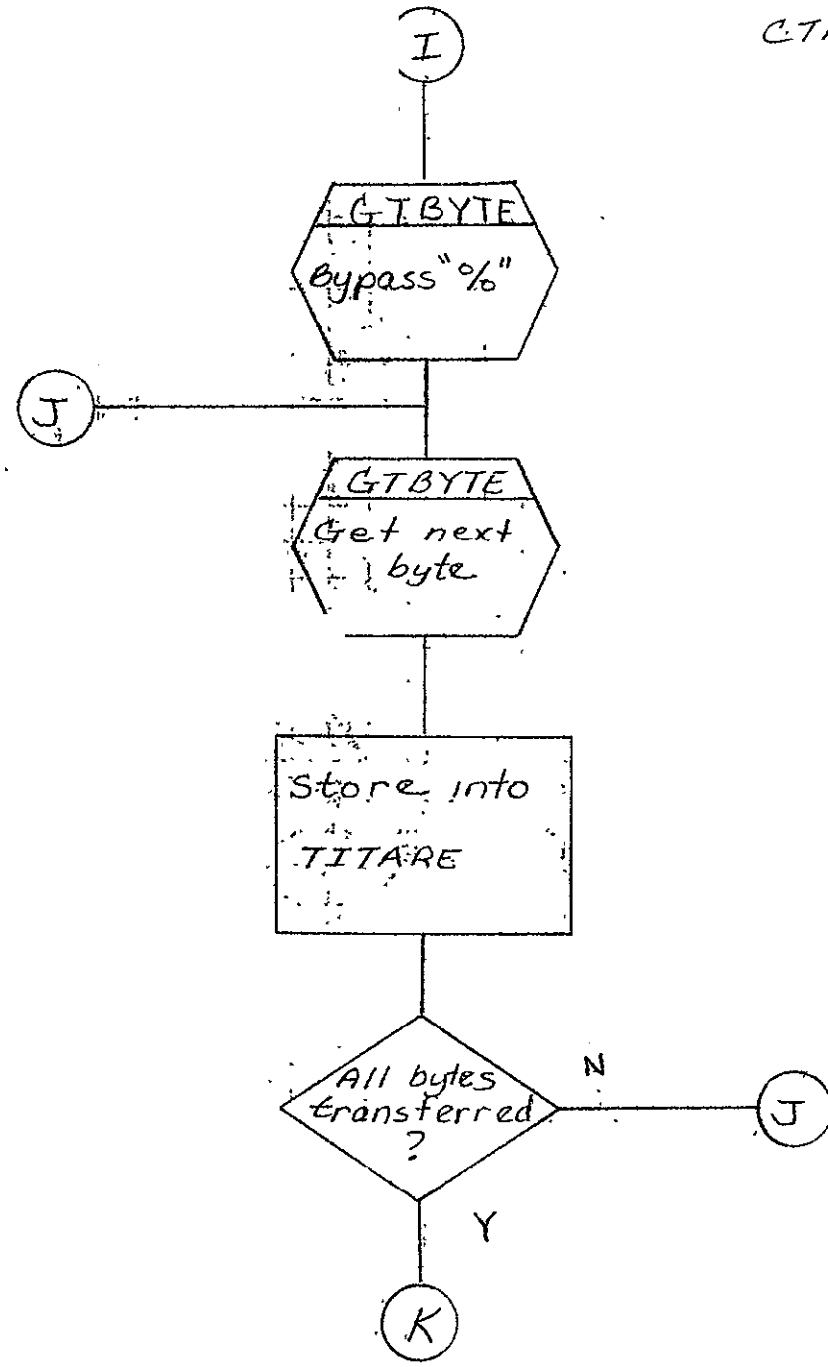

E
Is it ASCII % ?
N
Y
Get second byte of the record
Is it ASCII S ?
Y
F
N
Is it ASCII F ?
Y
G
N
Is it ASCII T ?
Y
G
N
H

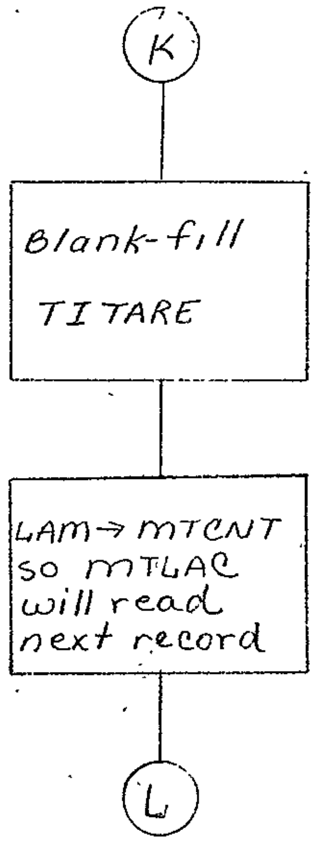
CTRLCK

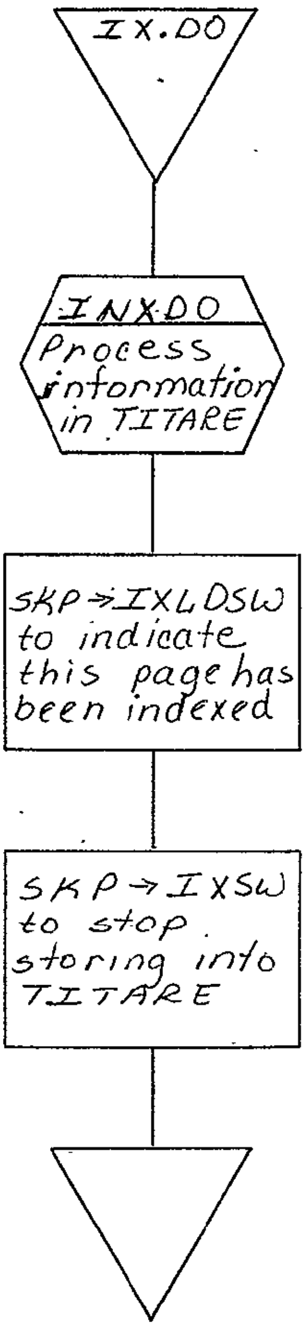


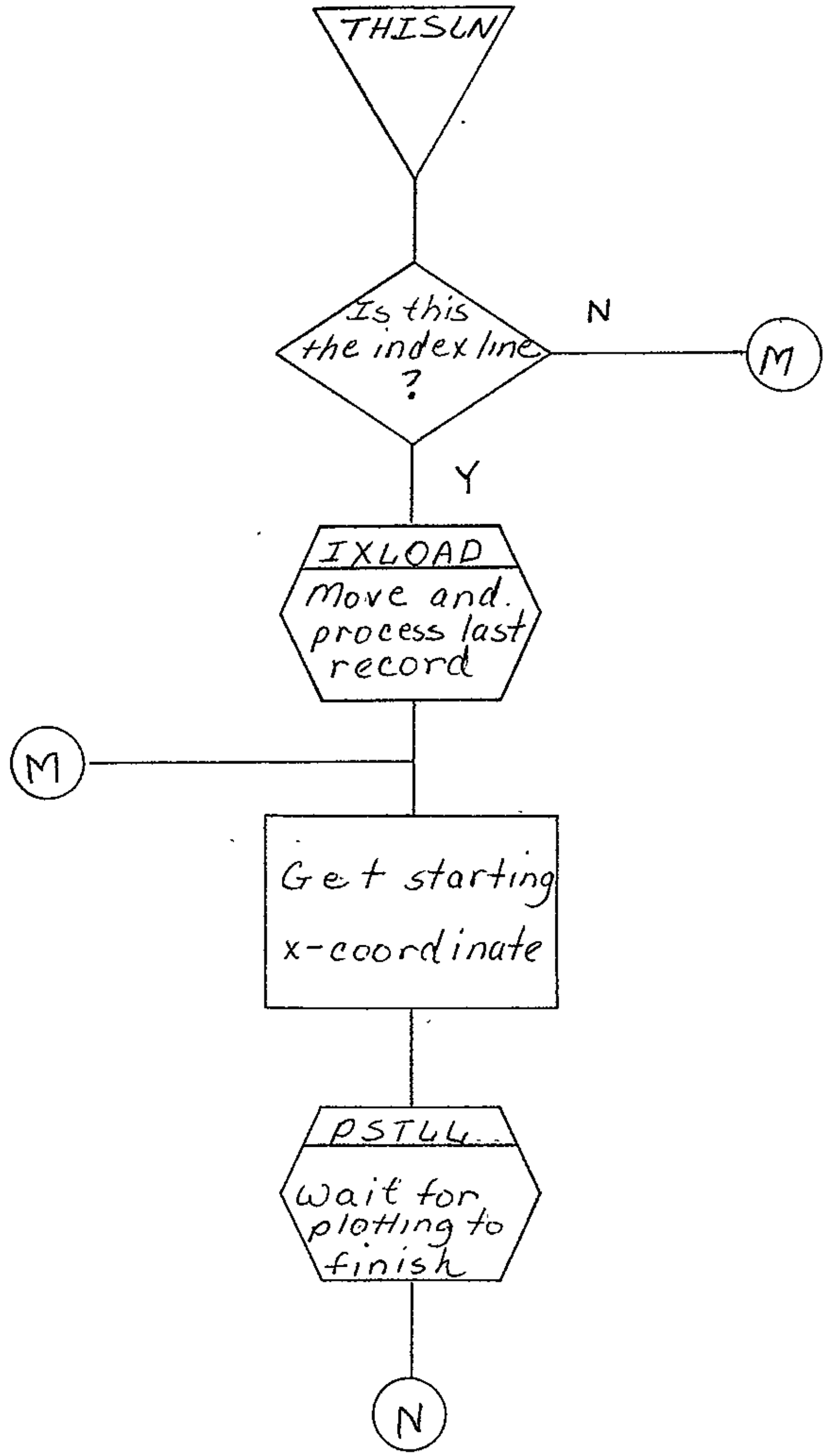

F
XX → JOBTLE to indicate information is from control record
SKP → S.FLAG to indicate info for this batch entered
G
TITARE → II
Set up for storing into TITARE
Initialize GTBYTE
I

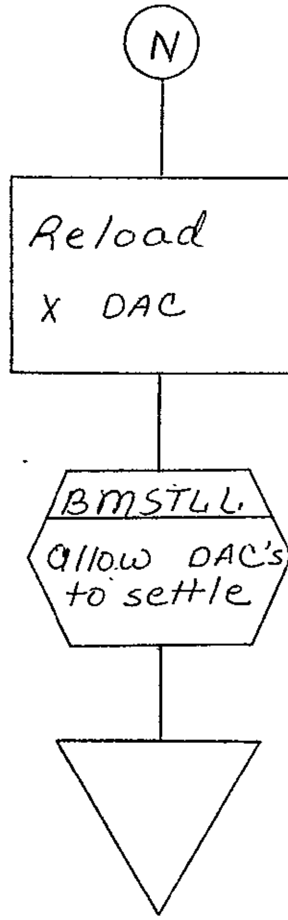
CTRUCK

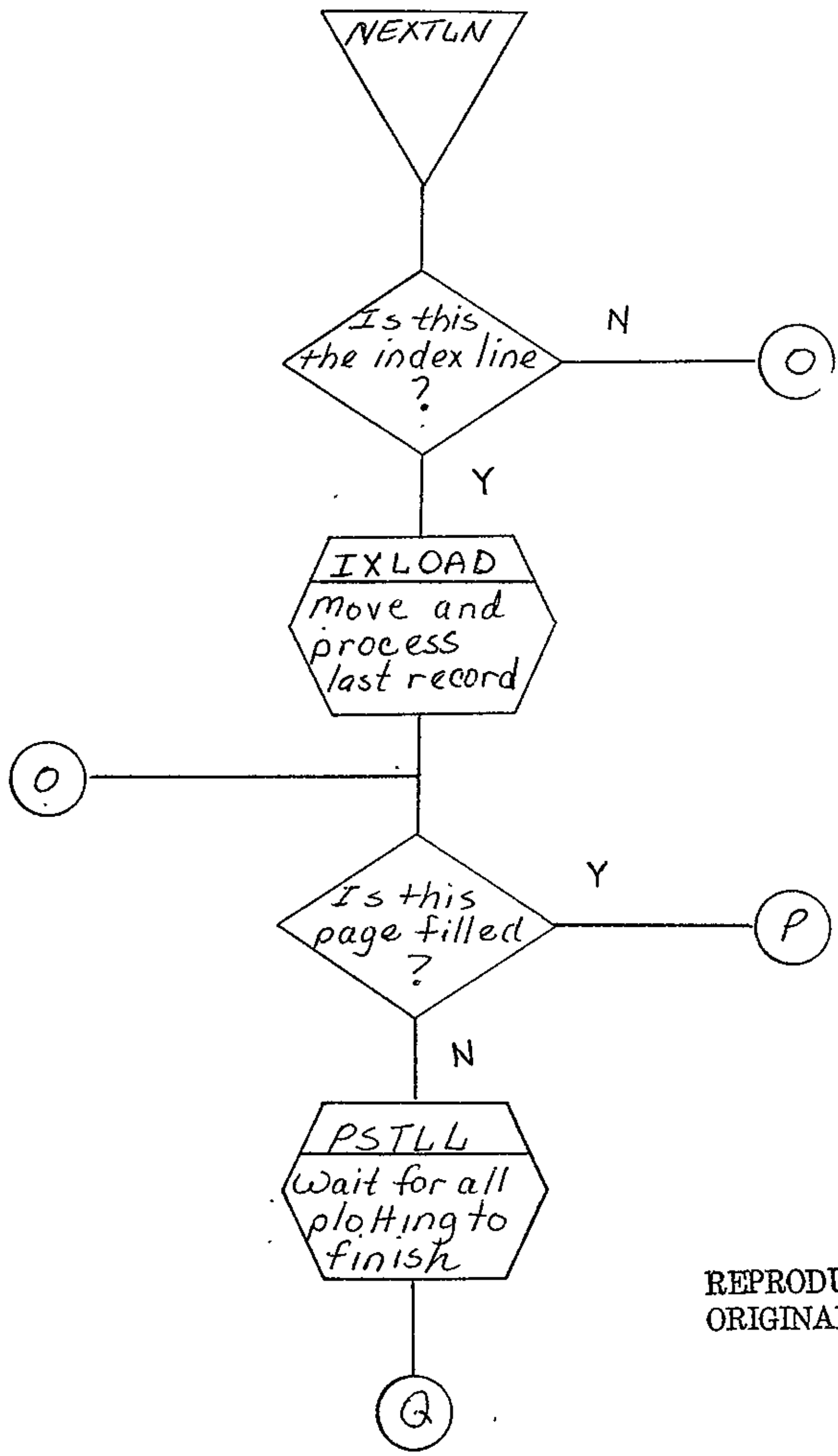

I
GTBYTE
Bypass "%"
J
GTBYTE
Get next byte
Store into TITARE
All bytes transferred ?
N
J
Y
K

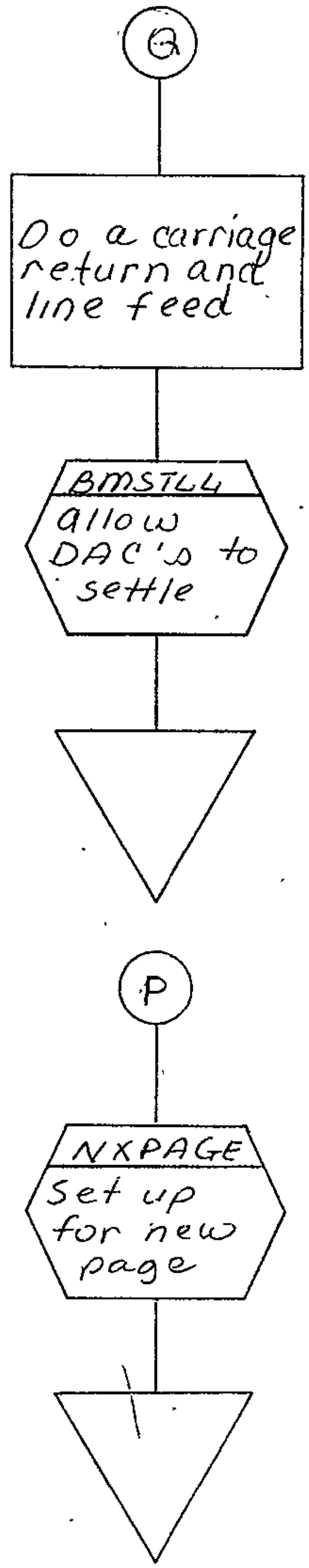

K
Blank-fill
TITARE
LAM → MTCNT
so MTLAC
will read
next record
L

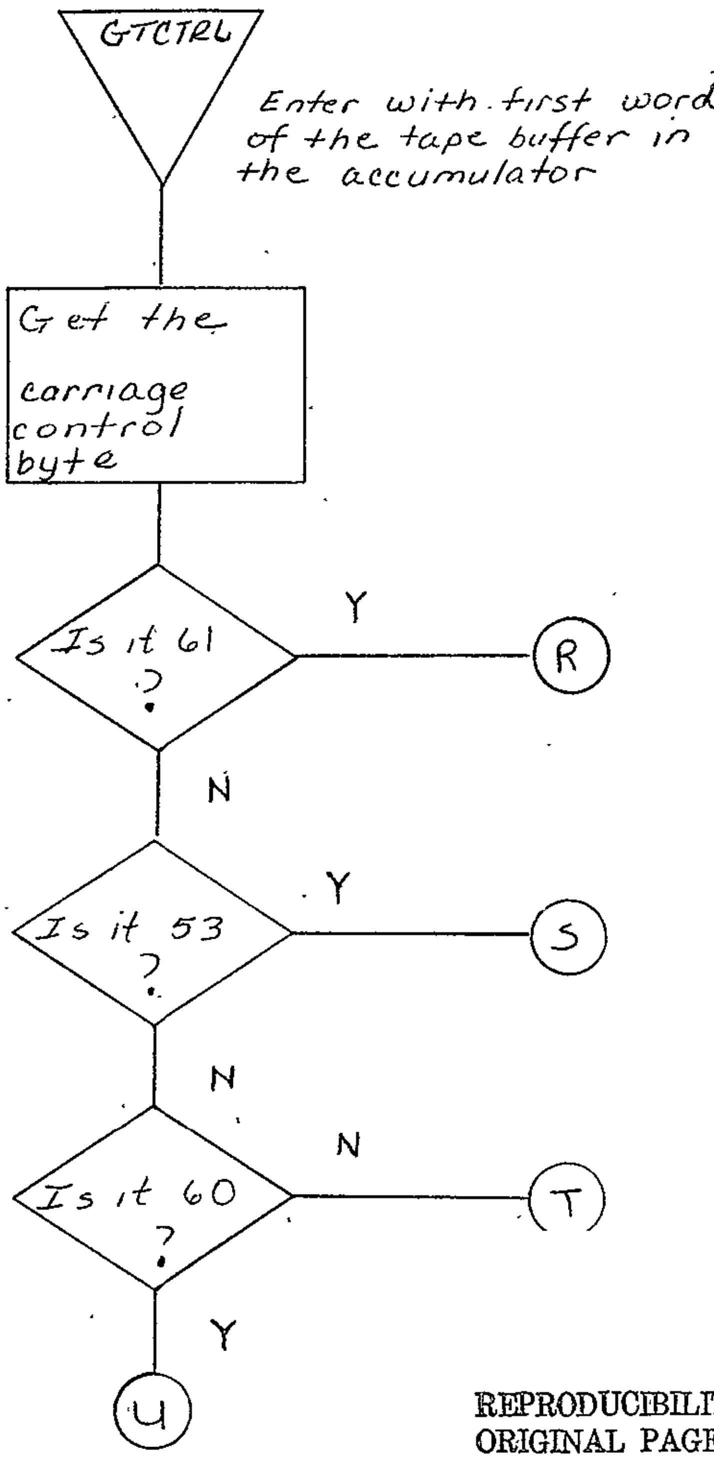

IX.DO
INXDO
Process information in TITARE
SKP→IXLDSW to indicate this page has been indexed
SKP→IXSW to stop storing into TITARE

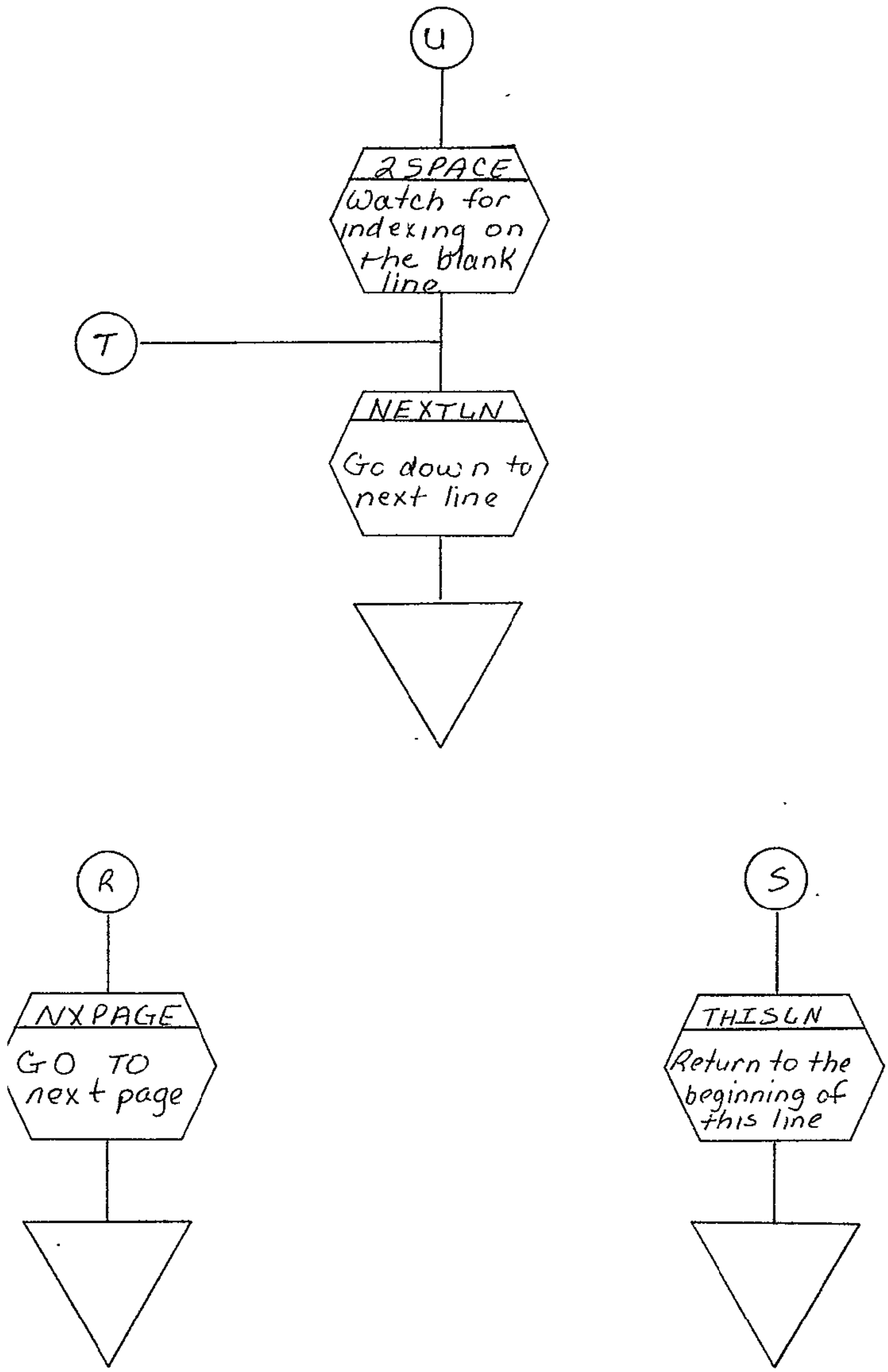

THISLN
Is this the index line?
N
M
Y
IXLOAD
Move and process last record
M
Get starting x-coordinate
PSTLL
wait for plotting to finish
N

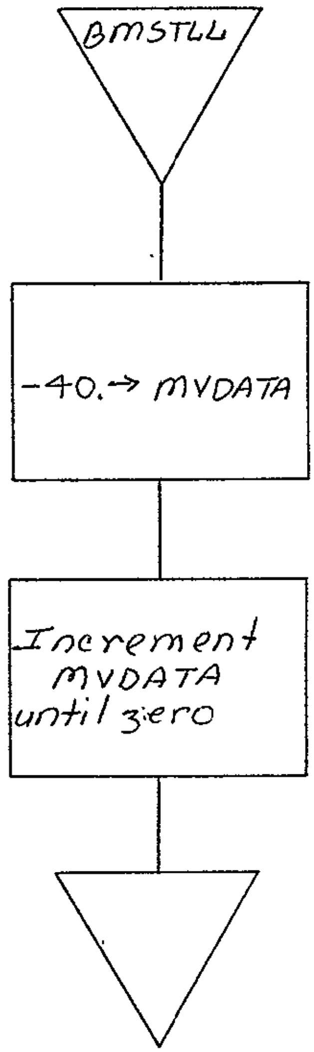

N
Reload
X DAC
BMSTLL
allow DAC's
to settle

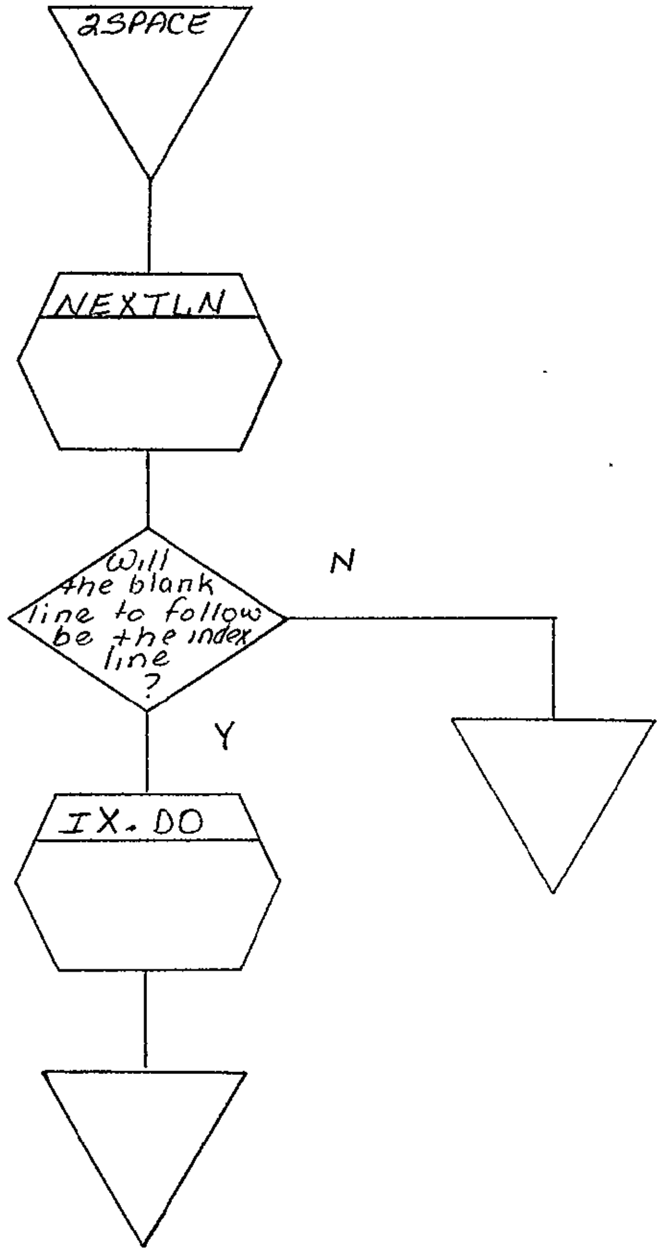

NEXTLN
Is this the index line ?
N
O
Y
IXLOAD
move and process last record
O
Is this page filled ?
Y
P
N
PSTLL
Wait for all plotting to finish
Q

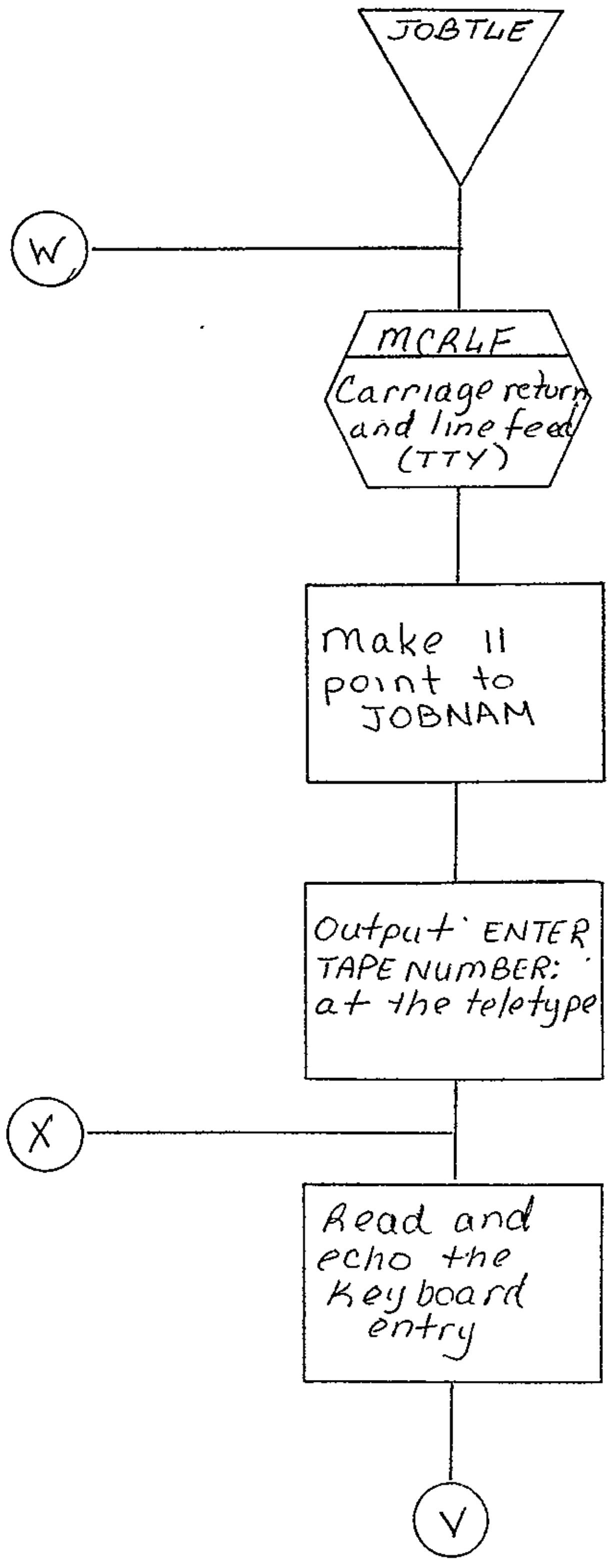

Q
Do a carriage return and line feed
BMSTL4
allow DAC's to settle
P
NXPAGE
Set up for new page

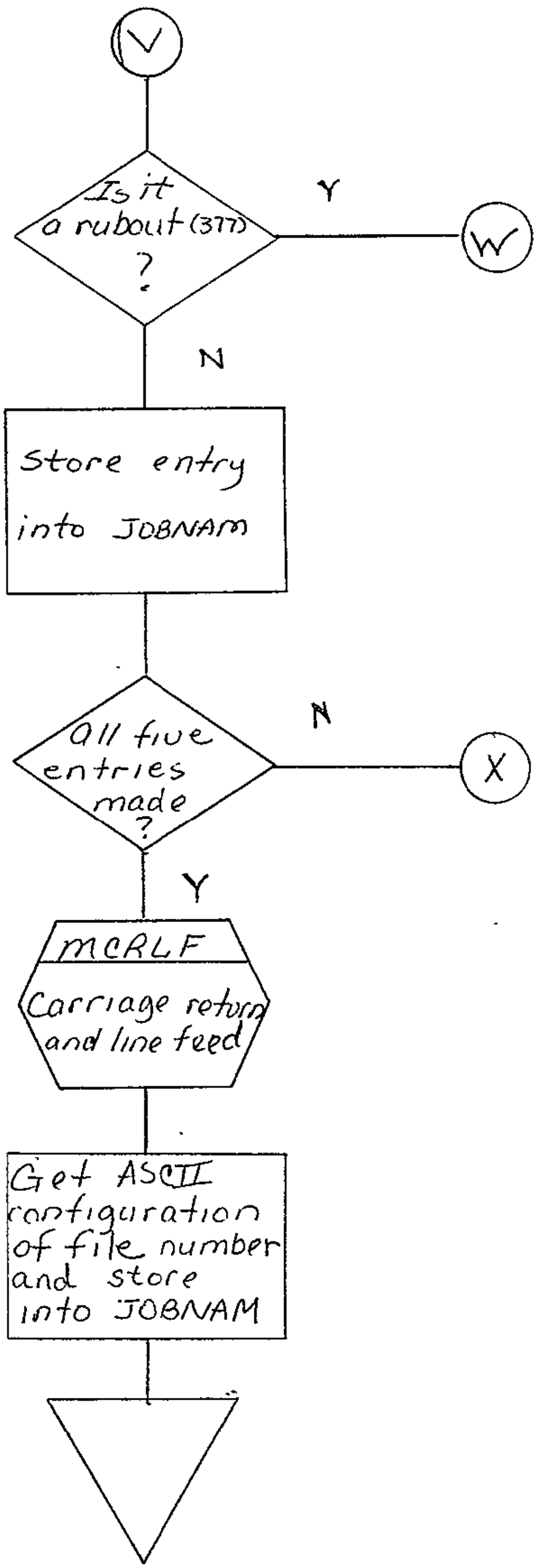

GTCTRL
Enter with first word of the tape buffer in the accumulator
Get the carriage control byte
Is it 61 ?
Y
R
N
Is it 53 ?
Y
S
N
Is it 60 ?
N
T
Y
U

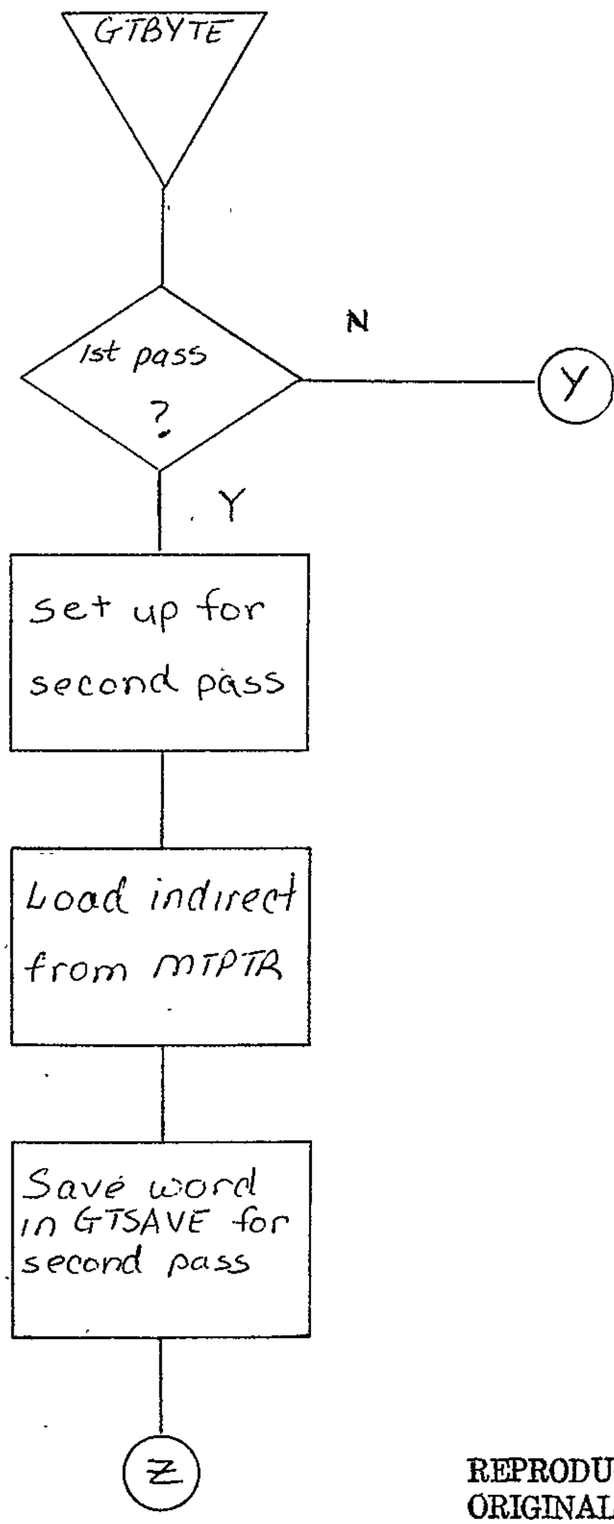

U
2SPACE
Watch for indexing on the blank line
T
NEXTLN
Go down to next line
R
NXPAGE
GO TO next page
S
THISLN
Return to the beginning of this line


BMSTLL
-40. → MVDATA
Increment
MVDATA
until zero


2SPACE
NEXTLN
Will the blank line to follow be the index line ?
N
Y
IX.DO


JOBTLE
W
MCRLF
Carriage return and line feed (TTY)
Make I1 point to JOBNAM
Output `ENTER TAPE NUMBER:' at the teletype
X
Read and echo the Keyboard entry
V


V
Is it a rubout (377) ?
Y
W
N
Store entry into JOBNAM
all five entries made ?
N
X
Y
MCRLF
Carriage return and line feed
Get ASCII configuration of file number and store into JOBNAM



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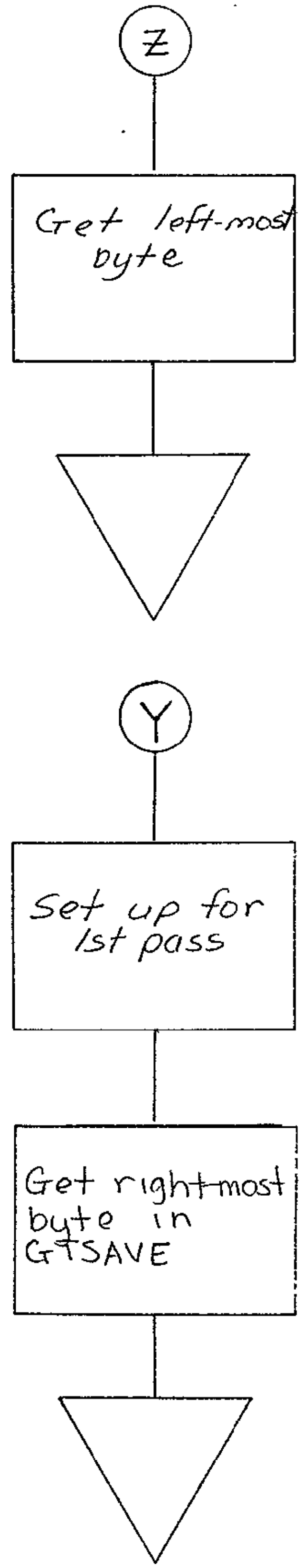
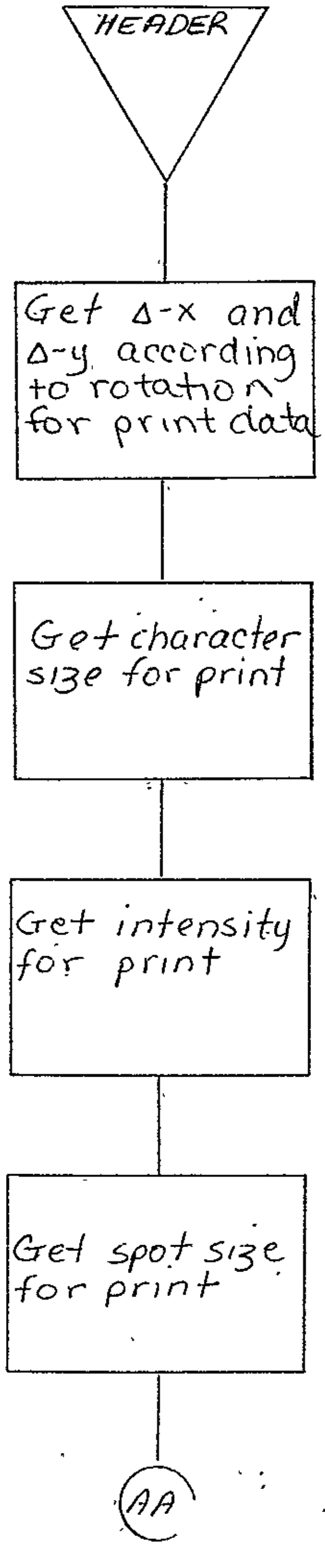
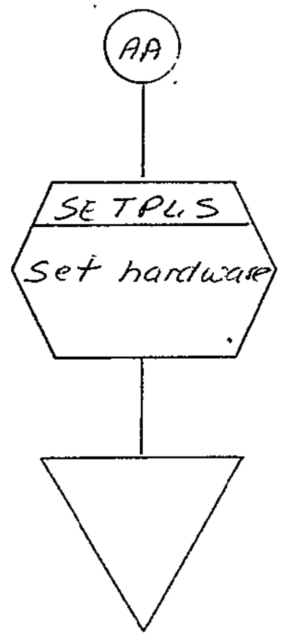
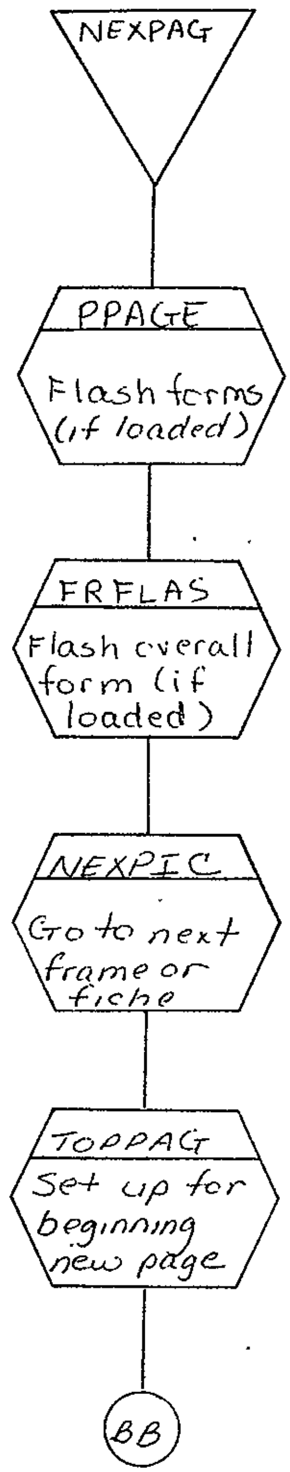
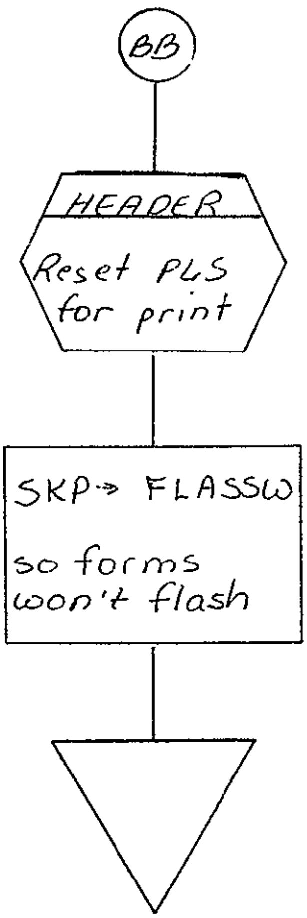
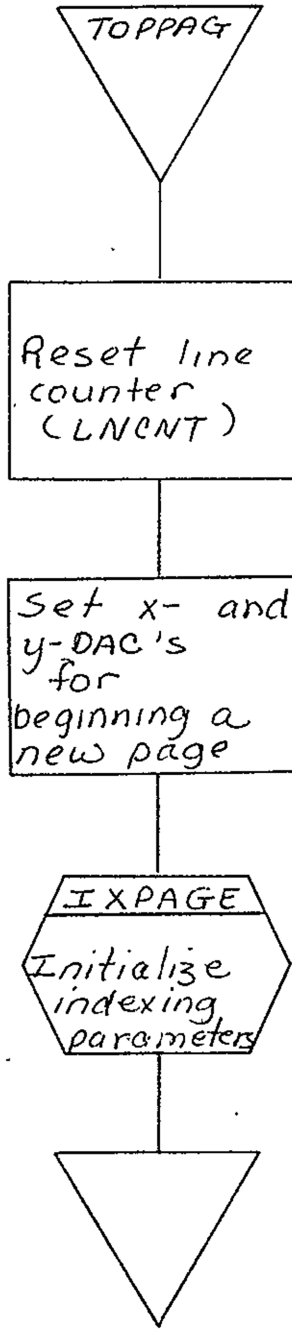

Z
Get left-most byte
Y
Set up for 1st pass
Get right-most byte in GTSAVE


HEADER
Get Δ-x and Δ-y according to rotation for print data
Get character size for print
Get intensity for print
Get spot size for print
AA


AA
SETPLS
Set hardware


NEXPAG
PPAGE
Flash forms (if loaded)
FRFLAS
Flash overall form (if loaded)
NEXPIC
Go to next frame or fiche
TOPPAG
Set up for beginning new page
BB


BB
HEADER
Reset PLS for print
SKP→ FLASSW
so forms won't flash



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2.5 COMA HCO TABULAR PROCESSOR FOR 105 mm FICHE (HCOTAB)

2.5.1 Background

A. Author. Franklin C. Ashton, Aeronutronic Ford Corp.

B. Intent. HCOTAB processes 9-track and 7-track magnetic tapes formatted in 36-bit DTE language as delineated by SISO.

C. Program History

1. Production Tape Date. 26 November 1974

2. Author. Franklin C. Ashton

3. Authorization. EO-191F

4. Test Case. TPS No. A6

5. Revisions. Reference Appendix B, paragraph B.5

2.5.2 Introduction

2.5.2.1 Hardware Requirements

- FR80 with 12K memory
- 9-track magnetic tape unit
- 7-track magnetic tape unit
- 105 mm camera

2.5.2.2 Software Requirements. The following files, found in III's SYM Directory, are required.

III109	III164 FILM	III161
III166	III163	III161 GO
III164	III147	III187
III162	III186	
III185	PRINTF COMM	

2.5.2.3 Assembly Parameters. The assembly parameters in III109 shall be set for the proper machine configuration. Assembly parameters specific to the HCOTAB Processor are as follows.

A. TWOBUF. If 1, indicates two magnetic tape buffers for higher throughput.

B. BIGBUF. If 0, allows maximum amount of operator functions with minimum buffer space.

C. DASHED. Assemble code for generation of dashed vectors.

D. CIRCLE. Assemble code for generation of circles and arcs.

E. LOCASE. Lower case character set required.

F. EBCDIC. Entire EBCDIC character set required.

G. 7TRACK. If 1, 7-track magnetic tape handler required.

H. 9TRACK. If 1, 9-track magnetic tape handler required.

I. MUMBLE. Defines system configuration output via teletype during assembly.

J. FONT. If 0, assemble standard III character font.

K. TAPELB. Assemble code for processing of IBM standard tape labels.

L. DTE. If 1, assemble code specific to 36-bit DTE processing.

M. NASA. If 1, include NASA-specific character descriptors in character set.

N. MANYUP. If 1, defines code for multiple images per frame for 105 mm microfiche.

O. TITLE. If 1, assemble routines for fiche titling.

2.5.2.4 Operator Commands. The following commands, entered by the operator via teletype, are available for use with the HCOTAB program.

TIME

FRAME

GO

CONTINUE

TITLE

END JOB

CLEAR

REWIND

SKIP

TRY AGAIN

STANDARD LABEL

UNLABELLED

2.5.3 Analysis

2.5.3.1 Major Control Section

A. Description. Upon issuance of a GO command by the operator via the console teletype, the III routine PSTART transfers control to the DTE processing routine BEGIN. BEGIN initializes all switches and does initial camera advancing and positioning using III routines FC7CLR, FRSPIC, and NEXPIC. A call is made to BATNO for input from teletype of the COM tape number, source tape number, and film roll number. BATNO initializes the fiche title routine, FICTAP, for the ID fiche. BEGIN then determines the location and size of the data input buffer, calculates the X and Y scaling factors for centering the image in the 16K by 16K area, and transfers control to GETCOM, which initializes parameters to access a DTE data word and transfers control to BITCNT. BITCNT, using the III routine MTBYTE, accesses the number of data bits requested by GETCOM and transfers control to GETOP with the data bits in the AC (up to 18 bits per access).

When a magnetic tape read is initiated and it is the initial read for a job, a test is made by BITCNT for COM controls. If they are not present, the data is ignored and the next data record is accessed. This procedure is repeated until the first COM control record is accessed, when BITCNT checks for a S or T identifier in the second byte of the record. If it is found, the record is moved to buffer TITARE for output via the III routine FICTAP. All records following the first COM control record are ignored for 105 mm processing until a second COM control record is accessed. BITCNT processes the second COM control record in the same manner as the first and transfers control to GETOP for processing of DTE data. GETOP determines from the DTE op code the type of DTE data word to be processed. The following paragraphs delineate the processing done for each type of DTE data word.

When the DTE word is a COMMAND, GETOP transfers control to ENDLN, which does a check to determine if the word is a JUMP. If not, it is ignored and control is returned to GETCOM. When the word is a JUMP, control is transferred to NEXFRM for advance to next frame via NEXPIC. Control is then returned to GETCOM.

When the DTE word is a VECTOR, the X_1Y_1 and X_2Y_2 coordinates are calculated and placed in XHD, YHD, XTL, and YTL. Control is transferred to MAP, which scales the heads and tails to the image size specified by DFRSZ. The X and Y DAC's are set via SETXYS, the vector is output by DRWVEC, and control is returned to GETCOM.

When a START PRINT word is accessed, TYPSW (typewriter switch) is set to allow processing of typewriter words. The character and character size are then masked from the START PRINT word and used to calculate the corresponding FR80 character and character size. This size is used for all characters until changed by another START PRINT word. Control is transferred to NOINDX. NOINDX scales the X and Y START PRINT coordinates to the FR80 image size via MAP, sets the X and Y DAC's using the III routine SETXYS, and outputs the START PRINT character via CHROUT. Control is then returned to GETCOM.

When the DTE word is a TYPEWRITER, the typewriter switch (TYPSW) is checked. When TYPSW is not set, the system halts (i.e., no previous START PRINT word to give coordinates). When TYPSW is set, each character of the TYPEWRITER word is output via CHROUT. CHROUT converts each DTE character to the appropriate FR80 character code and size and outputs the character using III routine VCHAR. When the last character of the TYPEWRITER word is processed, control is returned to GETCOM.

B. Input/Output

1. Input. Data input via 9-track magnetic tape consists of DTE 36-bit command, instruction, and data words and COM control records. All input data tapes are recorded in a variable spanned length record format (blocked or unblocked). Detailed descriptions of the format(s)/data content of the magnetic data tapes are found in SH-09607A.

2. Output. Data is output to 105 mm film. Each frame contains one DTE image.

3. Message Output

   a. ENTER SOURCE TAPE. Output to the teletype at job initialization. Operator inputs up to 12 characters of information, terminated by a carriage return.

   b. ENTER COM TAPE. Output to the teletype after ENTER SOURCE TAPE response. Operator inputs up to 12 characters of information, terminated by a carriage return.

c. ENTER ROLL. Output to the teletype after ENTER COM TAPE response. Operator inputs up to 12 characters of information, terminated by a carriage return.

C. Linkages

1. External

Routine	Program
FC7CLR	III166
FRSPIC	III166
MNBRIT	III166
NEXPIC	III166
MTRINI	III163
KYBLIS	III166
GETT	III163
SETXYS	III162
SETHD	III162
SETTL	III162
DRWVEC	III162
PSTLL	III166
SETPLS	III166
VCHAR	III147
MTBYTE	III163
FICTAP	III186
MDONEX	III166
FCFIN	III166
FLASH	III187

2. Internal Routines

BATNO	NOINDX	GETSG2	SAVADD
GETCOM	SETCR	GETBLK	RESTOR
GETOP	CHROUT	CCNTRL	RETRN
GETCR	ENDLN	SEPREC	RESET
TYPSW	CONVRT	TITREC	NEWSEG
TYPLP	NEXFRM	IGNORE	EBGET
TYPNL	BITCNT	BTTY	MVCOM
TYPMA	GETSEG	BATEND	MAP
TYPCR	GETSG1	IGNOR1	SCAL

2.5.3.2 Subroutines

A. BATEND. Outputs the trailing ID fiche at end of job. Calling sequence: JMS BATEND

B. BATNO. Accepts source tape number, COM tape number, and roll number from the operator. The subroutine is called to output the title fiche. Calling sequence: JMS BATNO

C. BITCNT. Entered with the AC containing the number of bits to be accessed. Uses MTBYTE to get bits requested, returning to the calling routine with the bits requested in the AC. Calling sequence, where $1 \leq N \leq 18$:

```
LAC N
JMS BITCNT
```

D. BTTY. Accepts up to 12 characters from TTY and stores one character per word. If the user wishes to use less than 12 characters, he terminates the string of input characters with a carriage return and the routine will space-fill the rest of the buffer. The subroutine converts ASCII characters to EBCDIC. A rubout character will allow the user to start reinputting the character string. Calling sequence, where LAC is address of where to store character:

```
LAC
JMS BTTY
```

E. CCNTRL. Accesses eight-bit carriage control characters via GET and checks for COM control indicator. If it is not found, routine exits. If it is found, routine checks next byte for legitimate COM control function and branches to the proper handler. Calling sequence: JMS CCNTRL

F. CHROUT. Entered with the AC containing a character to be output. Converts character to EBCDIC via CONVRT, outputs character via VCHAR, and returns control to calling routine. Calling sequence, where N = eight-bit DTE character:

```
LAC N
CHROUT
```

G. CONVRT. Entered with DTE character in AC. Character is converted to EBCDIC via DTETAB table. Exit is to calling routine with converted character in AC. Calling sequence, where N = DTE character:

```
LAC N
JMS CONVRT
```

H. DTESZ. Loads set size and pulldown as input from the TTY. Also sets scaling parameters for frame. Exits via MDONEX. Called via MONTOR.

I. EBGET. Converts EBCDIC numeric string, length of which is specified in SETXYS, to decimal. Numbers are accessed from magnetic tape via GET. Converted number is in AC upon exit to calling routine. Calling sequence, where N = length of numeric string:

```
LAM N
DAC SETXYS
JMS MVCOM
```

J. ENDLN. Checks command word for JUMP; if found, advances to next frame via NEXFRM and gets next DTE data word. If not found, data is ignored and next DTE data word is accessed. Control is transferred to GETCOM. Calling sequence: JMS ENDLN

K. GETBLK. Accesses 32 bits of data from magnetic tape via MTBYTE. Used to read record block and mask off block discriptor word (BDW). Exits to calling routine. Calling sequence: JMS GETBLK

L. GETCOM. For 36-bit DTE words, "bit buckets" four-bit pad, calls KYBLIS for operator interrupt processing, and transfers control to GETOP. GETCOM is called for all DTE data word decodes. Calling sequence: JMP GETCOM

M. GETCR. Determines if 36-bit DTE word is a typewriter or start print word. Control is transferred to TYPSW or SETCR, respectively. Calling sequence: JMP GETCR

N. GETOP. Gets four-bit op code and determines if data word is a command or vector word. If neither, control is transferred to GETCR. If COMMAND, control is transferred to ENDLN. Calling sequence: JMP GETOP

O. GETSEG. Gets logical record segment from tape input area. Determines segment control code, segment length, and carriage control from segment descriptor word (SDW). If segment length is two or less, control is returned to GETSEG+1 for next logical record segment. If segment control code is 0 or 1, which specifies COM control record, CCNTRL is called for processing of the COM control record. Upon return from CCNTRL, control is transferred to calling routine. Calling sequence: JMS GETSEG

P. IGNORE. Remains in loop ignoring data via BITCNT until next COM control record or logical segment is read, with control being transferred to the applicable routine by BITCNT.

Q. IGNOR1. Sets applicable switches to remain within GETSEG routine until DTE data has been accessed.

R. MAP. Sets XHD, YHD, XTL and YTL DTE vector coordinates scaled to FR80 units. Coordinates are centered in 16K × 16K frame. Calling sequence, with XHD, YHD, XTL, YTL containing DTE vector coordinates (return to calling routine with XHD, YHD, XTL, YTL containing FR80 coordinates): MAP

S. MVCOM. Transfers COM control data, as specified in the S or T record, into buffer TITARE. Data is accessed from tape buffer one byte per access, via GET. Calling sequence, with AC containing first titling character: JMS MVCOM

T. NEWSEG. Reads in new logical segment; gets bits requested from old and new segment and returns to calling routine with data in AC. Calling sequence: JMP NEWSEG

U. NEXFRM. Sets titling intensity, advances to next frame, resets intensity, and exits to calling routine. Calling sequence: NEXFRM

V. NOINDX. Entered with XHD and YHD containing DTE character coordinates and CHTEM containing eight-bit DTE character. Scales coordinates to FR80 units, sets X and Y DAC's, outputs character, and transfers control to GETCOM. Calling sequence: JMP NOINDX

W. RESET. Sets switches specifying COM control; sets return address in GETSEG and BITCNT to return to calling routine. Calling sequence: JMS RESET

X. RESTOR. Restores BITCNT and GETSEG parameters to condition previous to COM control loop. Calling sequence: RESTOR

Y. RETRN. Saves return address from BITCNT for original call; this is done prior to COM control processing. Calling sequence: JMS RETRN

Z. SAVADD. Saves BITCNT and GETSEG return addresses prior to COM control loop. Calling sequence: SAVADD

AA. SCAL. Entered with AC containing DTE coordinate. Exits to calling routine with AC containing coordinate in FR80 units. Calling sequence, where $1 \leq N \leq 1023$:

```
LAC N
SCAL
```

BB. SEPREC. Entered with AC containing first character of S record. Calls MVCOM, calls FICTAP for control record processing. Sets CH11SW and SEGSW for control record skip via BITCNT. Exits to IGNORE. Calling sequence: JMP SEPREC

CC. SETCR. Sets TYPSW for TYPEWRITER word processing, converts DTE character size to appropriate FR80 size, and DTE character deltas to FR80 units (CHDELX, CHDELT). Sets deltas based on rotation via ROTTST and SETPLS. Accesses starting line coordinates by call to GET storing X in XHD and Y in YHD. Exits via NOINDX. Calling sequence: JMP SETCR

DD. TITREC. Moves title data into TITARE via MVCOM, calls FICTAP for title processing. Transfers control to IGNORE. Calling sequence: JMP TITREC

EE. TYPLP. Processes DTE special characters NULL, CR, and MR; if these are not present, outputs as print character via CHROUT until CNTR (character counter -4 for 36) is exhausted. Entered either through TYPSW or JMP TYPLP. Exits to GETCOM.

2.5.3.3 Constants and Variables

A. Internal

1. BATARE. Table for the BEGIN and END title fiche.

2. BEGN. Message BEGIN output on ID fiche.

3. BITNSV. Temporary save location of number of bits requested by GET macro in SAVADD and RESTOR routines.

4. BITNUM. Contains number of bits requested by GET macro.

5. BITSVAD. Temporary save location of return address from GET call.

6. BTABL. Table used for conversion of ASCII characters to EBCDIC.

7. BTCT. Variable used as counter in BATNO subroutine.

8. BTLN. Constant length of ID title.

9. CHTEM. Cell containing DTE character accessed from START PRINT word.

10. CH11SW. Switch used for entry and exit into COM control processing. Set to JMS RESET after S COM record, and NOP upon completion of second COM control record processing.

11. CMTAP. Buffer containing COM tape number as input from TTY. Output to ID fiche.

12. CNTR. Counter containing number of characters per DTE typewriter word.

13. CTMES. Message ENTER COM TAPE, output to teletype when accepting COM tape number for ID fiche.

14. DFRSZ. Constant containing frame size in FR80 units (13522 for 105 mm).

15. DTESIZ. Temporary cell containing DTE character size (0-7) accessed from start print word.

16. DTETAB. Table containing DTE character codes, two characters per word.

17. DTXTAB. Table containing character spacing values in DTE units for eight-character sizes.

18. DTYTAB. Table containing line feed values in DTE units for eight-character sizes.

19. ENEND. Message END, output on trailing ID fiche.

20. GETSGAD. Temporary save location of GETSEG routine return address.

21. MBITNM. Variable containing number of bits requested by GET macro in BITCNT routine.

22. MBITSV. Temporary save location of number of bits requested. Referenced in SAVADD and RESTOR.

23. NEWSGB. Variable containing n bits ($1 \leq n \leq 18$) of data from next record segment.

24. NEWSGC. Variable containing number of bits required from next record segment to satisfy GET macro.

25. OLDSGB. Variable containing n bits ($1 \leq n \leq 18$) of data remaining in current record segment.

26. OLDSGC. Variable containing number of bits remaining in current record segment.

27. RETADD. Cell containing BITCNT return address when processing COM control records.

28. RLL. Buffer where microfiche roll number is stored for ID fiche.

29. RLMES. Message ENTER ROLL, output to teletype when accepting roll number.

30. SEGCNT. Counter containing number of bits in current record segment.

31. SEGSW. Switch used to reset BITCNT return address upon completion of COM control processing.

32. SRMES. Message ENTER SOURCE TAPE, output to teletype when accepting source tape number for ID fiche.

33. SRTAP. Buffer containing source tape number for ID fiche.

34. SVIND. Address of teletype buffer for input information.

35. SZTAB. Table containing character heights in DTE units for eight-character sizes.

36. TIINFO. Buffer where BEGIN or END is stored for ID fiche.

37. TITINT. Constant delineating output light intensity for titling.

38. XHD. Contains starting X coordinate of DTE vector as accessed from DTE vector word.

39. XOFF. Starting X or left-side margin of DTE image in FR80 raster units.

40. <u>XSIGN</u>. Sign of X vector as defined by 36-bit DTE vector word.

41. <u>XTL</u>. Contains end X coordinate of DTE vector as accessed from DTE vector word.

42. <u>YHD</u>. Contains starting Y coordinates of DTE vector word.

43. <u>YOFF</u>. Starting Y or top margin of DTE image in FR80 raster units.

44. <u>YSGN</u>. Sign of Y vector as defined by 36-bit DTE vector word.

45. <u>YTL</u>. Contains end Y coordinate of DTE vector as accessed from DTE vector word.

B. <u>External</u>

1. <u>CHDELX</u>. Word location reserved for FR80 character delta.

2. <u>CHDELY</u>. Word location reserved for FR80 character delta.

3. <u>CHRSIZ</u>. Word location reserved for FR80 character size.

4. <u>CURBUF</u>. Cell used for current magnetic tape buffe address (one of two magnetic tape buffers).

5. <u>EXPND</u>. Location used to define end of executable code.

6. <u>FCSUB</u>. One-word cell used to either decrease or i crease margin between fiche.

7. <u>FCTTSW</u>. Switch used to control title extraction f tape or teletype.

8. FICTB. Address of fiche title table, i.e., titling buffer area.

9. FLSHND. Defines start of form flash executable code.

10. FRAMNM. One-word counter containing number of frames filmed.

11. MAXTRW. Constant used for multiple fiche title rows (always zero for DTE).

12. MTTARE. Contains teletype buffer address.

13. NEXBUF. Cell used for next magnetic tape buffer address (one of two magnetic tape buffers).

14. PBUFPT. Location used to define start of form flash communication area.

15. PICNUM. One-word counter containing number of images produced.

16. RECPIN. Word location reserved for FR80 light intensity value.

17. SCSIZE. Maximum available FR80 raster units (16384).

18. SVROT. One-word save location containing current rotation delineator.

19. TITARE. Address of fiche titling buffer.

20. TPOINT. Contains address of next available word in TITARE.

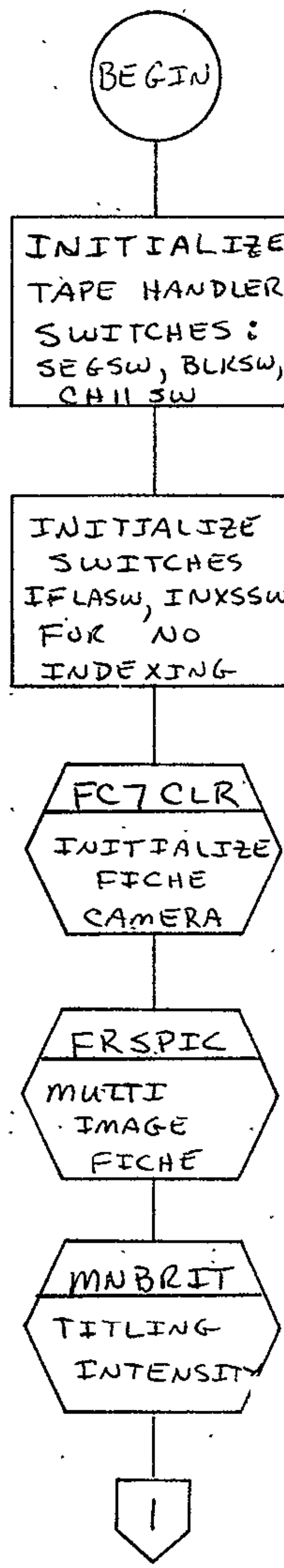
21. VHEADX. Word reserved for setting of starting X vector coordinate.

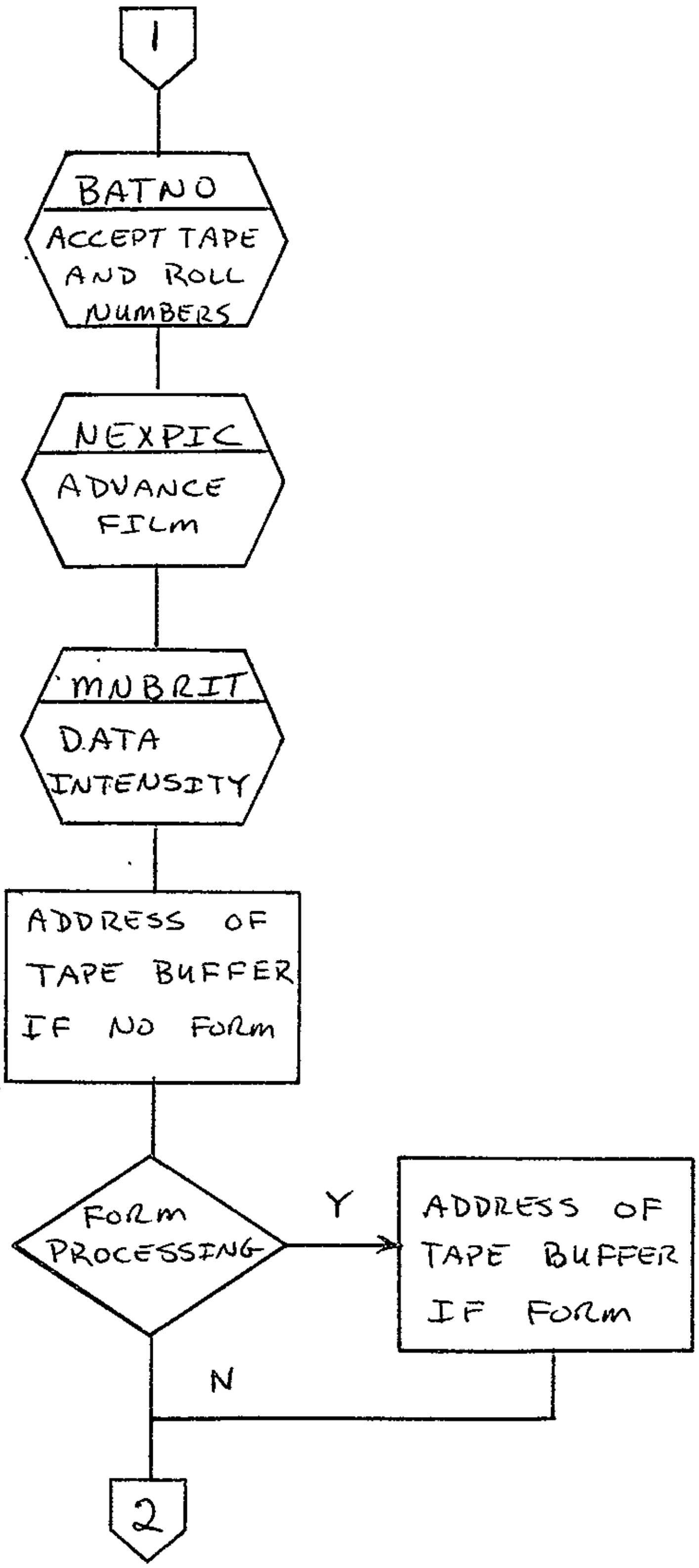
22. VHEADY. Word reserved for setting of starting Y vector coordinate.

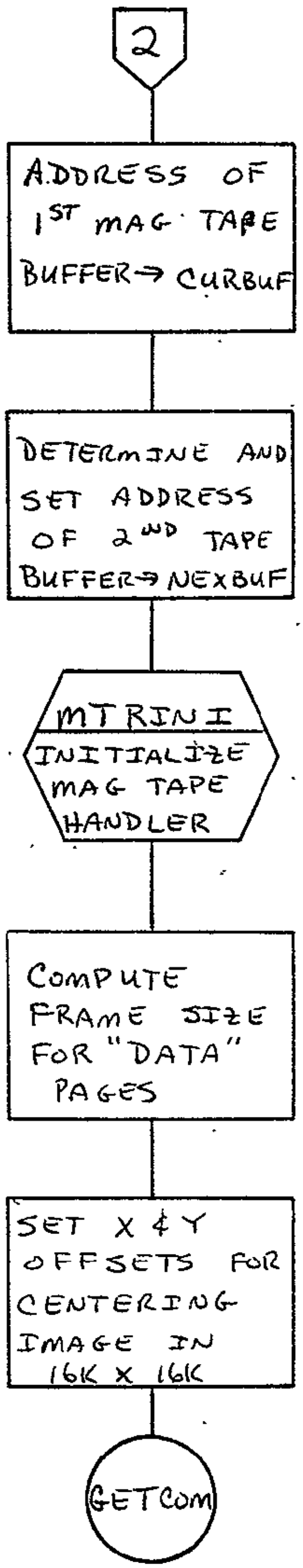
23. VTAILX. Word reserved for setting of ending X vector coordinate.

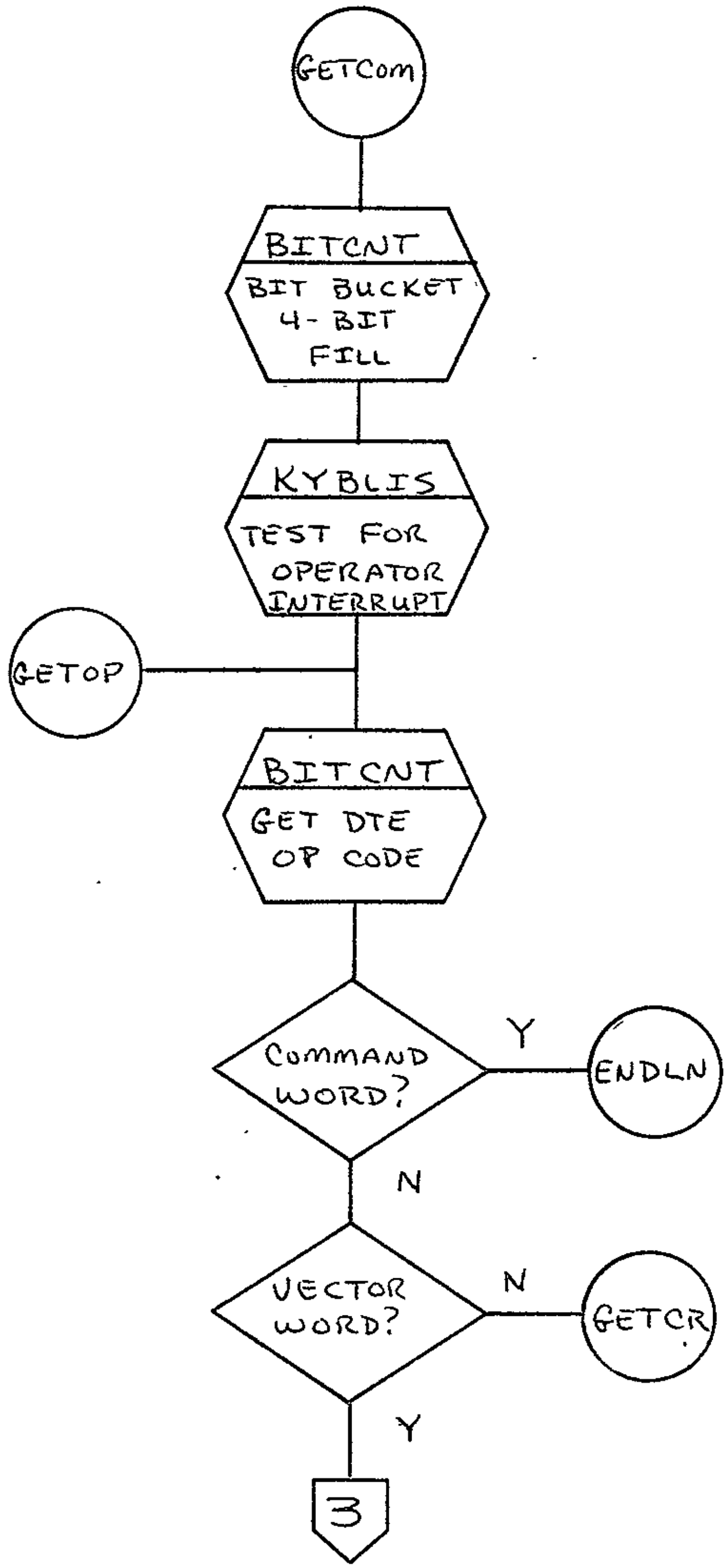
24. VTAILY. Word reserved for setting of ending Y vector coordinate.

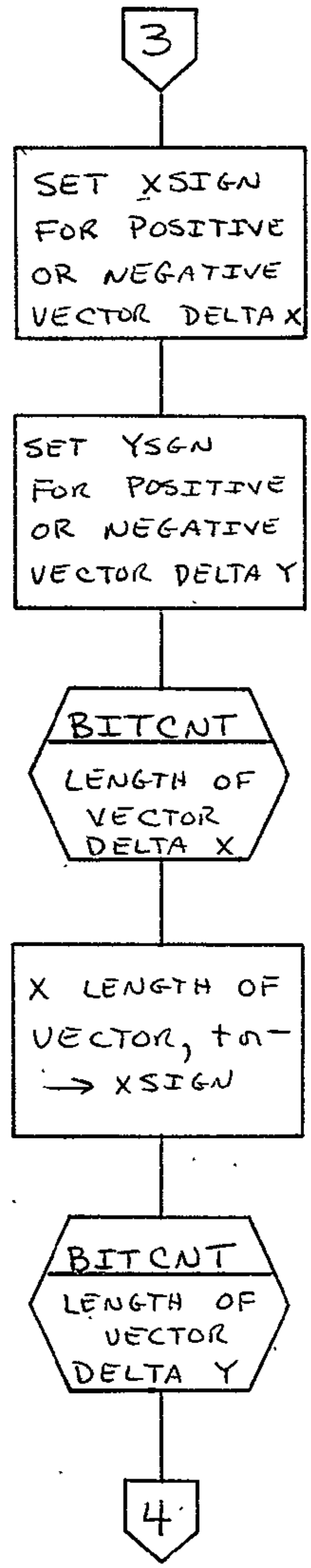
2.5.3.4 Flow Charts. See following pages.

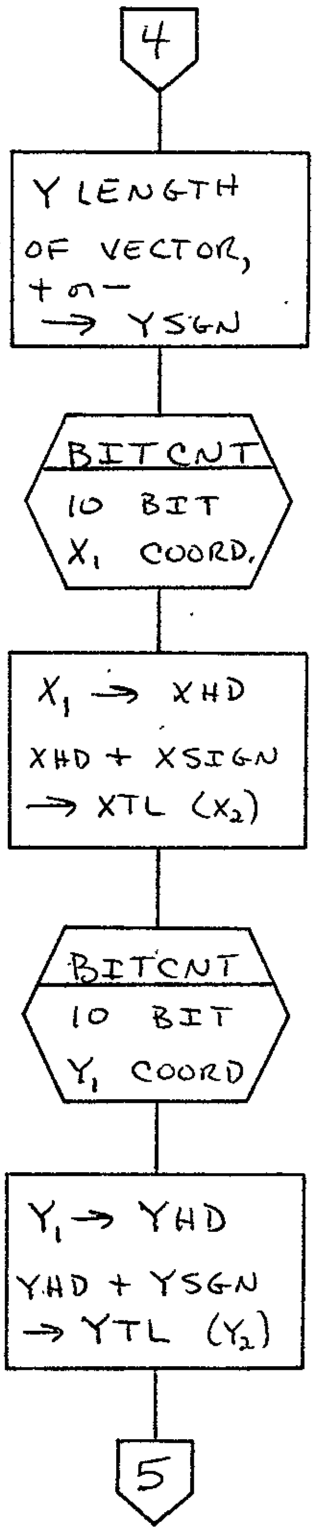

BEGIN
INITIALIZE TAPE HANDLER SWITCHES: SEGSW, BLKSW, CH11SW
INITIALIZE SWITCHES IFLASW, INXSSW FOR NO INDEXING
FC7CLR
INITIALIZE FICHE CAMERA
FRSPIC
MULTI IMAGE FICHE
MNBRIT
TITLING INTENSITY
1

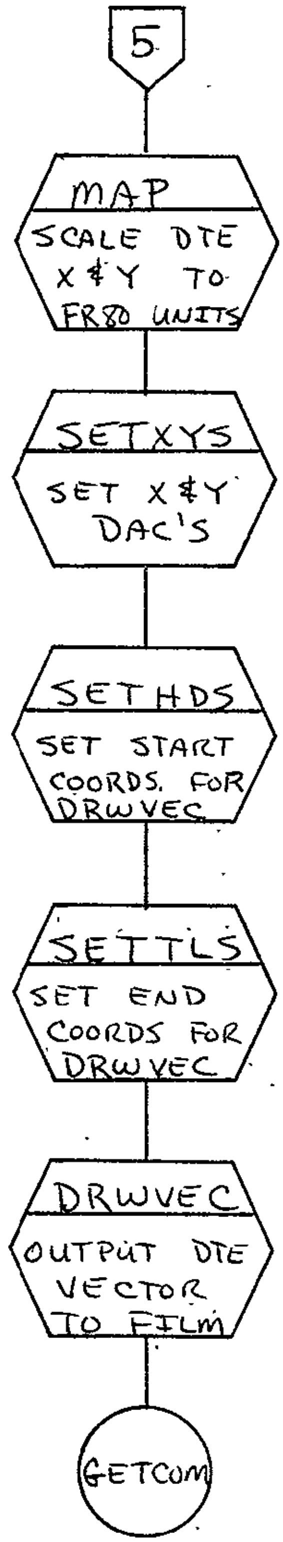

1
BATNO
ACCEPT TAPE AND ROLL NUMBERS
NEXPIC
ADVANCE FILM
MNBRIT
DATA INTENSITY
ADDRESS OF TAPE BUFFER IF NO FORM
FORM PROCESSING
Y
ADDRESS OF TAPE BUFFER IF FORM
N
2

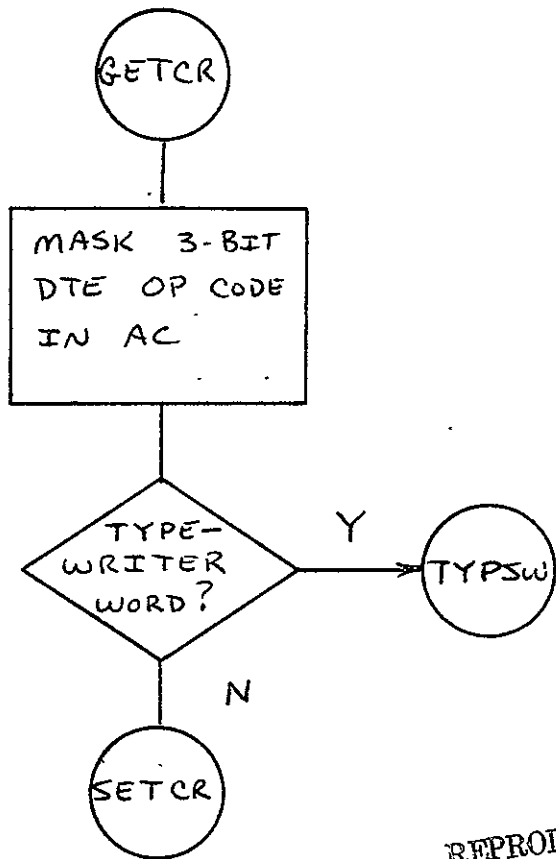

2
ADDRESS OF 1ST MAG TAPE BUFFER→ CURBUF
DETERMINE AND SET ADDRESS OF 2ND TAPE BUFFER→NEXBUF
MTRINI
INITIALIZE MAG TAPE HANDLER
COMPUTE FRAME SIZE FOR "DATA" PAGES
SET X & Y OFFSETS FOR CENTERING IMAGE IN 16K X 16K
GETCOM

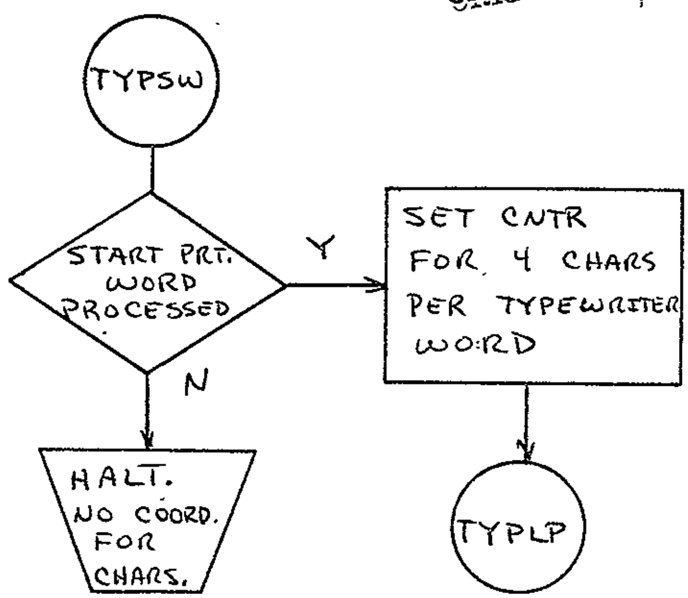

GETCOM
BITCNT
BIT BUCKET
4-BIT
FILL
KYBLIS
TEST FOR
OPERATOR
INTERRUPT
GETOP
BITCNT
GET DTE
OP CODE
COMMAND
WORD?
Y
ENDLN
N
VECTOR
WORD?
N
GETCR
Y
3

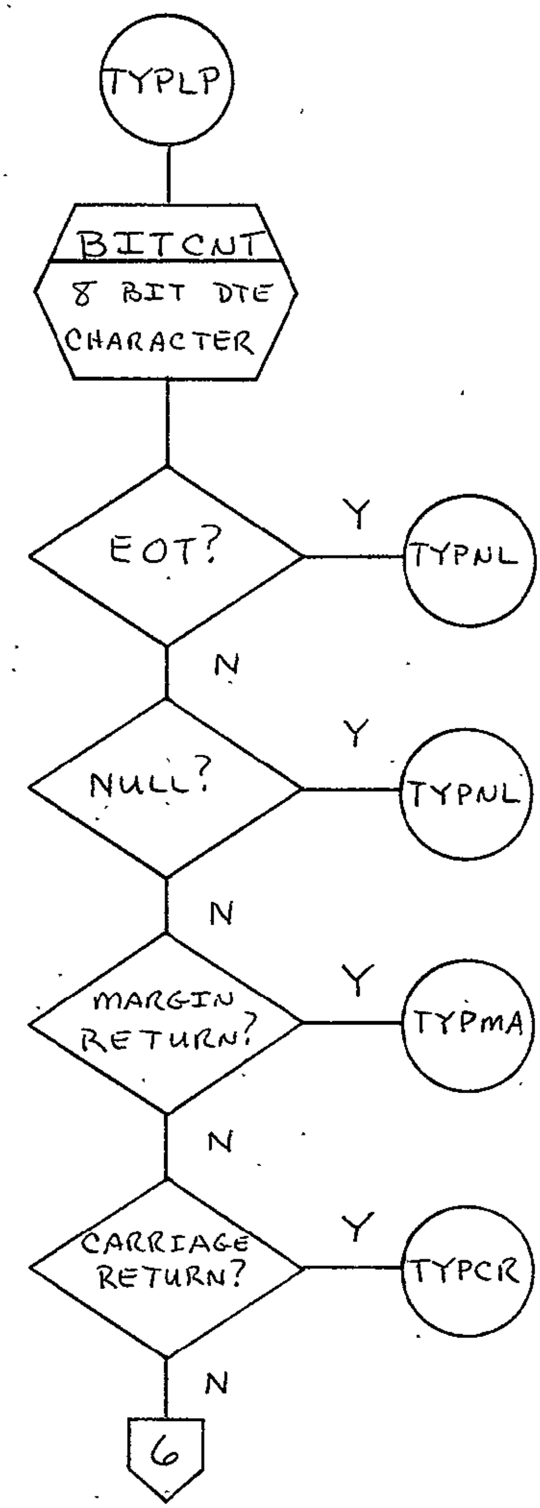

3
SET XSIGN FOR POSITIVE OR NEGATIVE VECTOR DELTA X
SET YSGN FOR POSITIVE OR NEGATIVE VECTOR DELTA Y
BITCNT
LENGTH OF VECTOR DELTA X
X LENGTH OF VECTOR, tn–
→ XSIGN
BITCNT
LENGTH OF VECTOR DELTA Y
4

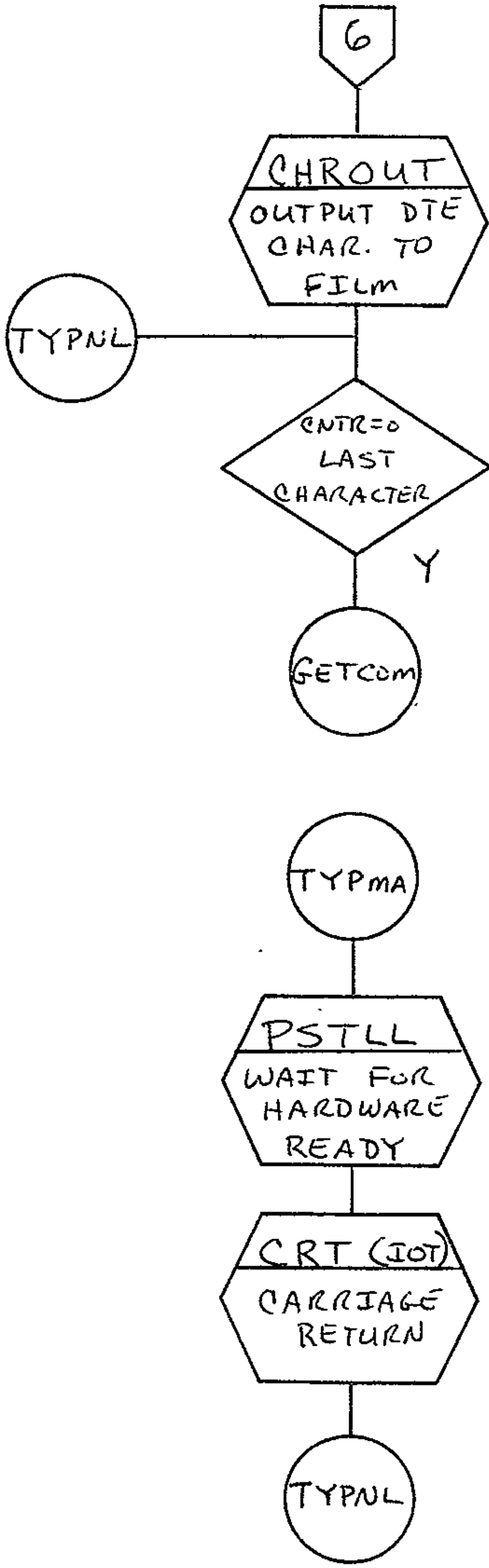

4
Y LENGTH
OF VECTOR,
+ or −
→ YSGN
BITCNT
10 BIT
X1 COORD.
X1 → XHD
XHD + XSIGN
→ XTL (X2)
BITCNT
10 BIT
Y1 COORD
Y1 → YHD
YHD + YSGN
→ YTL (Y2)
5

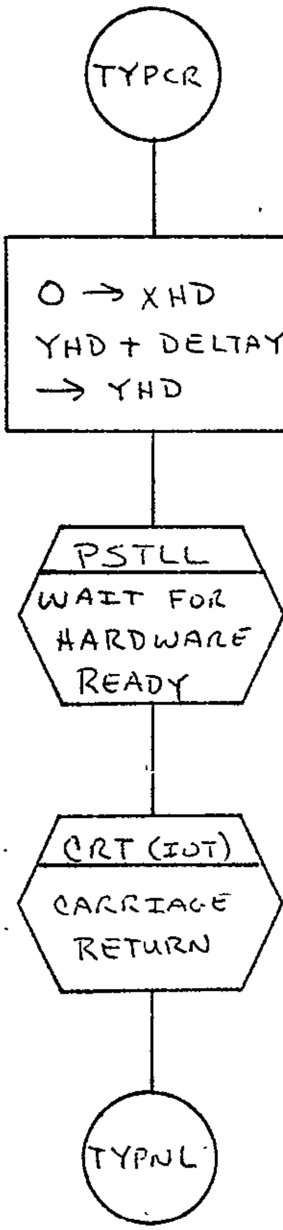

5
MAP
SCALE DTE X & Y TO FR80 UNITS
SETXYS
SET X & Y DAC'S
SETHDS
SET START COORDS. FOR DRWVEC
SETTLS
SET END COORDS FOR DRWVEC
DRWVEC
OUTPUT DTE VECTOR TO FILM
GETCOM

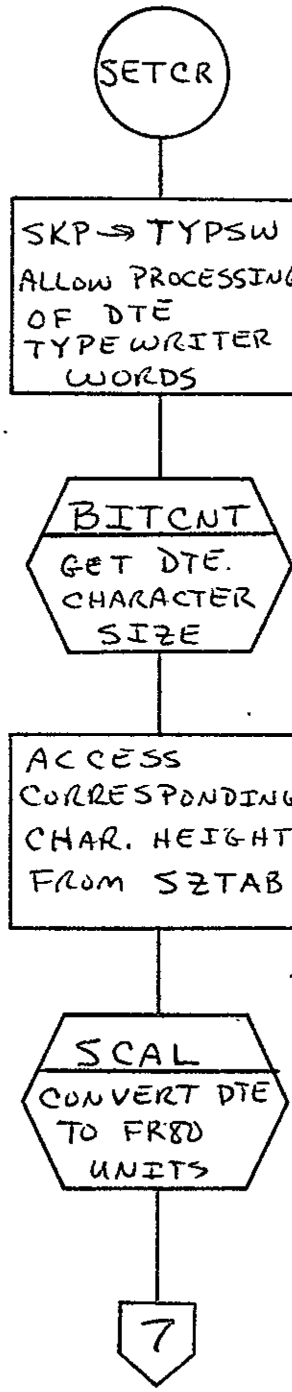

GETCR
MASK 3-BIT DTE OP CODE IN AC
TYPE-WRITER WORD?
Y
TYPSW
N
SETCR

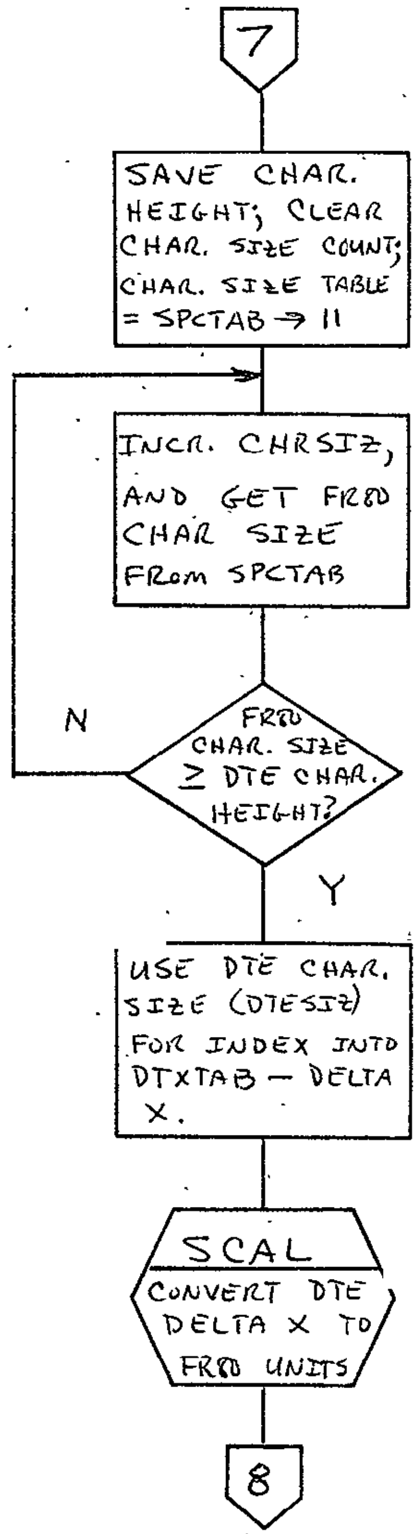

TYPSW
START PRT. WORD PROCESSED
Y
SET CNTR FOR 4 CHARS PER TYPEWRITER WORD
N
HALT. NO COORD. FOR CHARS.
TYPLP

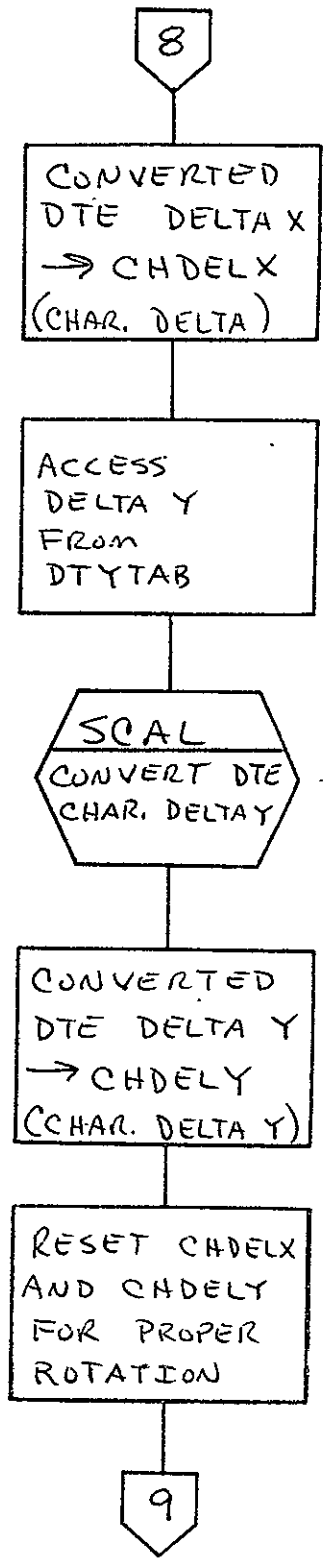

TYPLP
BITCNT
8 BIT DTE
CHARACTER
EOT?
Y
TYPNL
N
NULL?
Y
TYPNL
N
MARGIN
RETURN?
Y
TYPMA
N
CARRIAGE
RETURN?
Y
TYPCR
N
6

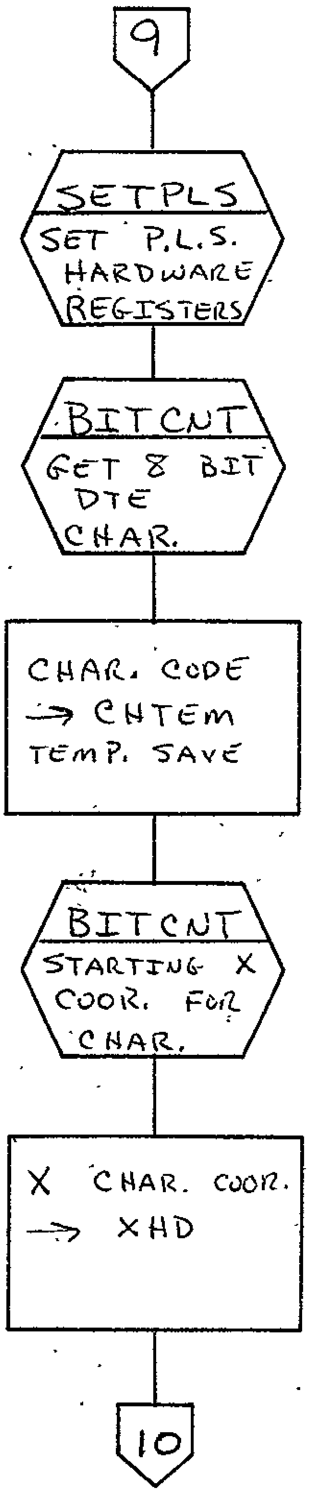

6
CHROUT
OUTPUT DTE CHAR. TO FILM
TYPNL
CNTR=0 LAST CHARACTER
N
TYPLP
Y
GETCOM
TYPMA
PSTLL
WAIT FOR HARDWARE READY
CRT (IOT)
CARRIAGE RETURN
TYPNL

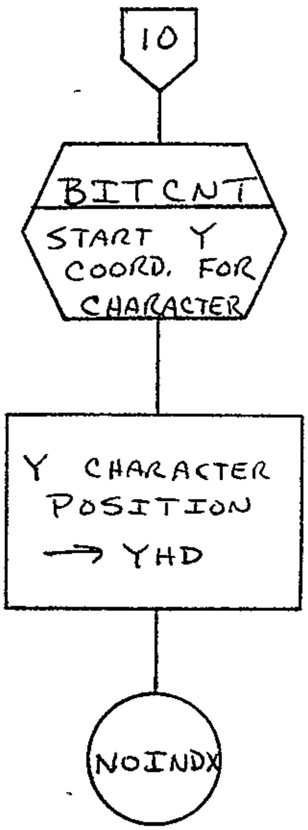

TYPCR
0 → XHD
YHD + DELTAY
→ YHD
PSTLL
WAIT FOR
HARDWARE
READY
CRT (IOT)
CARRIAGE
RETURN
TYPNL

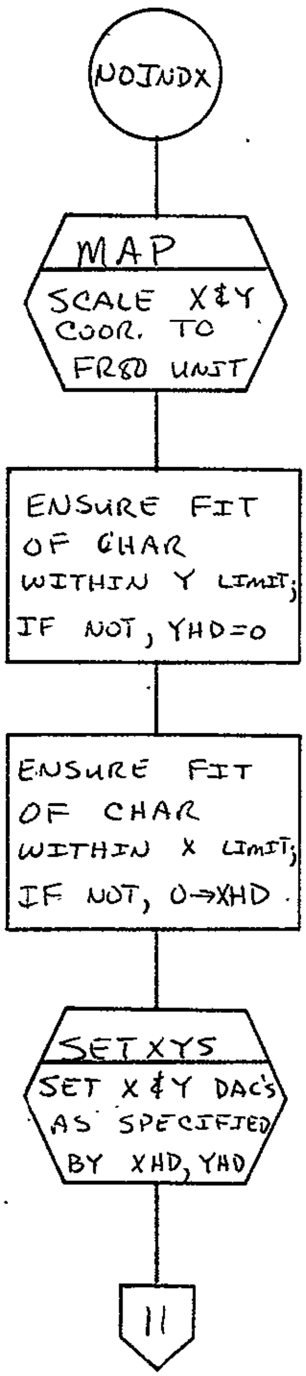

SETCR
SKP → TYPSW
ALLOW PROCESSING OF DTE TYPEWRITER WORDS
BITCNT
GET DTE CHARACTER SIZE
ACCESS CORRESPONDING CHAR. HEIGHT FROM SZTAB
SCAL
CONVERT DTE TO FR80 UNITS
7

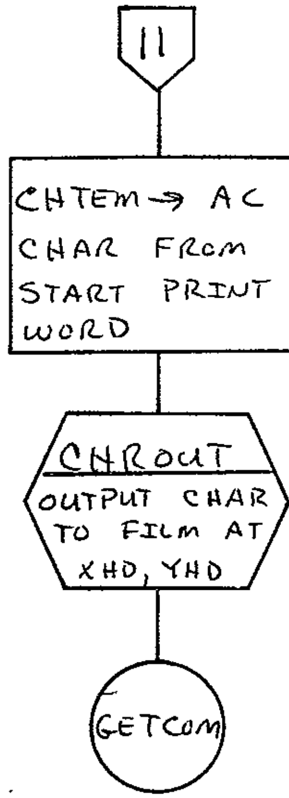

7
SAVE CHAR. HEIGHT; CLEAR CHAR. SIZE COUNT; CHAR. SIZE TABLE = SPCTAB → I1
INCR. CHRSIZ, AND GET FR80 CHAR SIZE FROM SPCTAB
FR80 CHAR. SIZE ≥ DTE CHAR. HEIGHT?
N
Y
USE DTE CHAR. SIZE (DTESIZ) FOR INDEX INTO DTXTAB — DELTA X.
SCAL
CONVERT DTE DELTA X TO FR80 UNITS
8

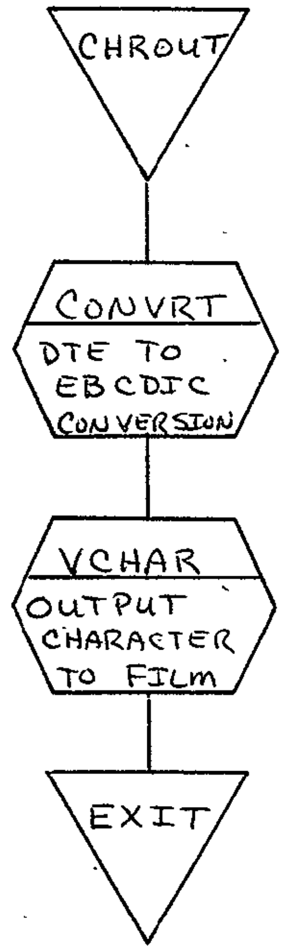

8
CONVERTED DTE DELTA X → CHDELX (CHAR. DELTA)
ACCESS DELTA Y FROM DTYTAB
SCAL
CONVERT DTE CHAR. DELTA Y
CONVERTED DTE DELTA Y → CHDELY (CHAR. DELTA Y)
RESET CHDELX AND CHDELY FOR PROPER ROTATION
9

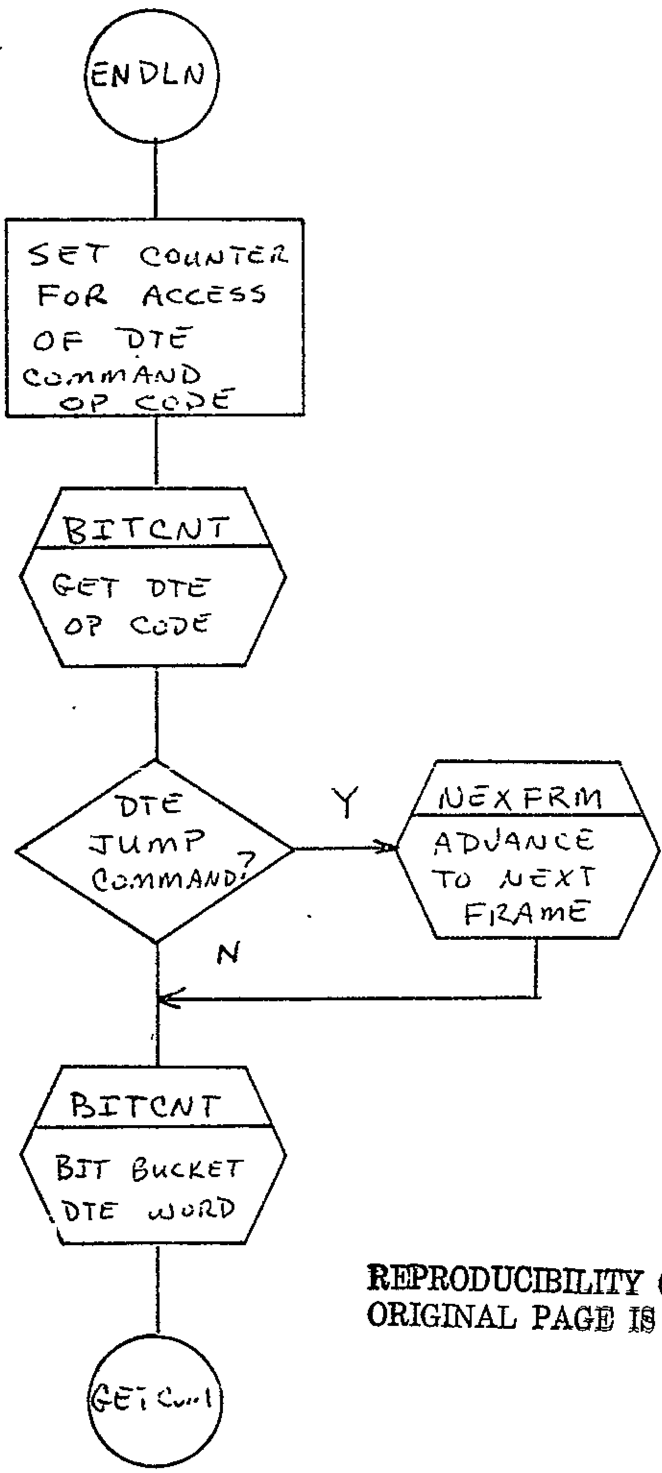

9
SETPLS
SET P.L.S. HARDWARE REGISTERS
BITCNT
GET 8 BIT DTE CHAR.
CHAR. CODE → CHTEM TEMP. SAVE
BITCNT
STARTING X COOR. FOR CHAR.
X CHAR. COOR. → XHD
10


10
BITCNT
START Y COORD. FOR CHARACTER
Y CHARACTER POSITION → YHD
NOINDX

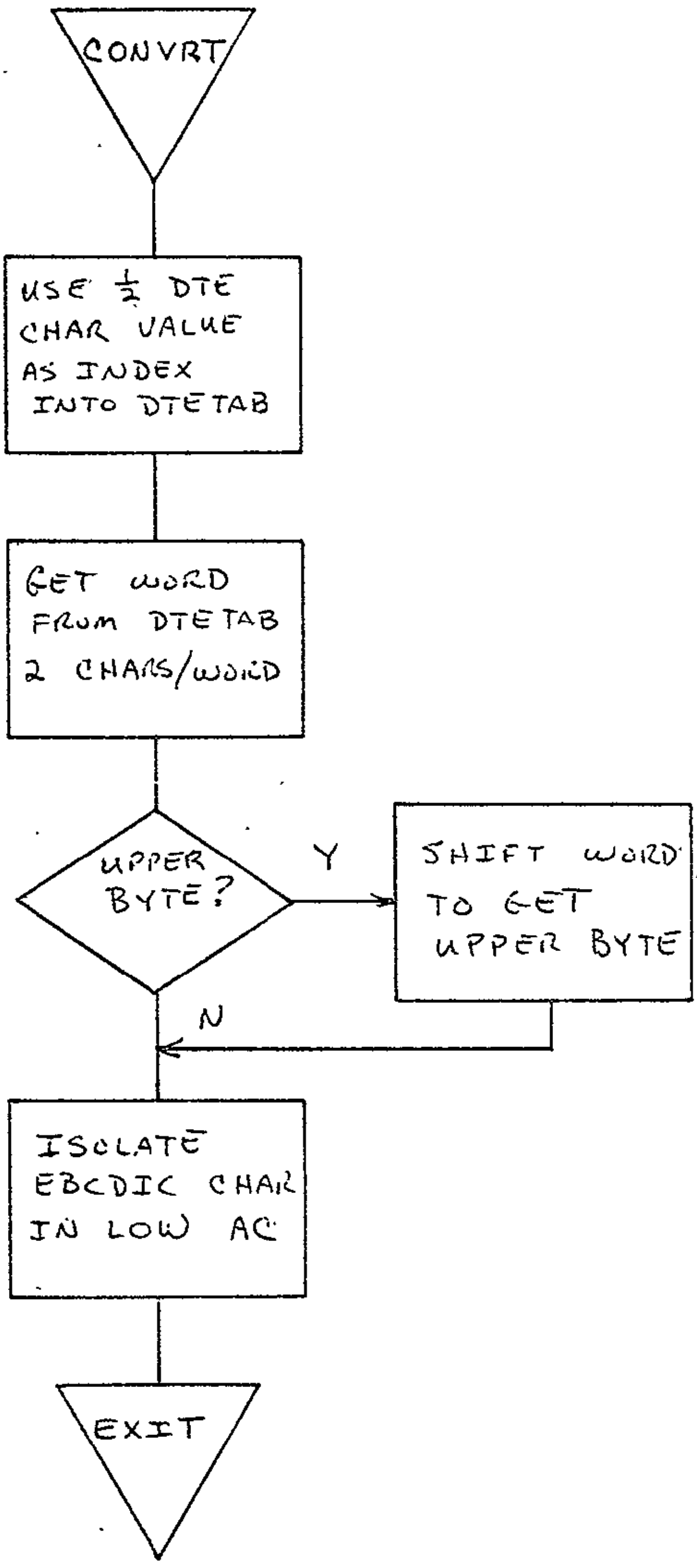

NOINDX
MAP
SCALE X&Y COOR. TO FR80 UNIT
ENSURE FIT OF CHAR WITHIN Y LIMIT; IF NOT, YHD=0
ENSURE FIT OF CHAR WITHIN X LIMIT; IF NOT, 0→XHD.
SETXYS
SET X&Y DAC's AS SPECIFIED BY XHD, YHD
11

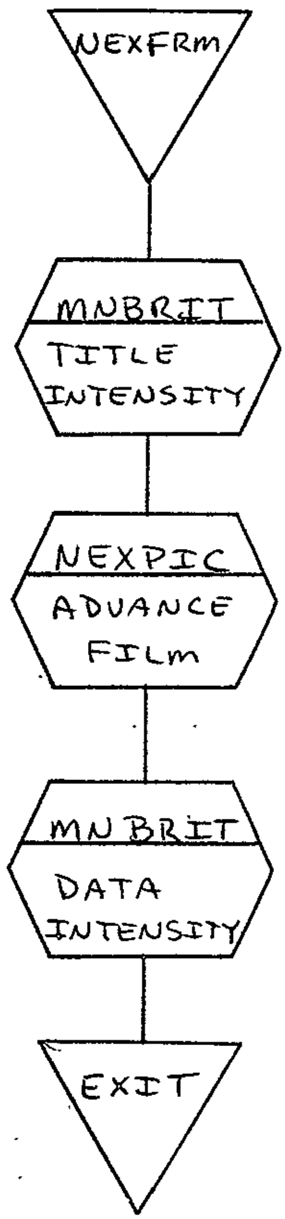

11
CHTEM → AC
CHAR FROM
START PRINT
WORD
CHROUT
OUTPUT CHAR
TO FILM AT
XHD, YHD
GETCOM

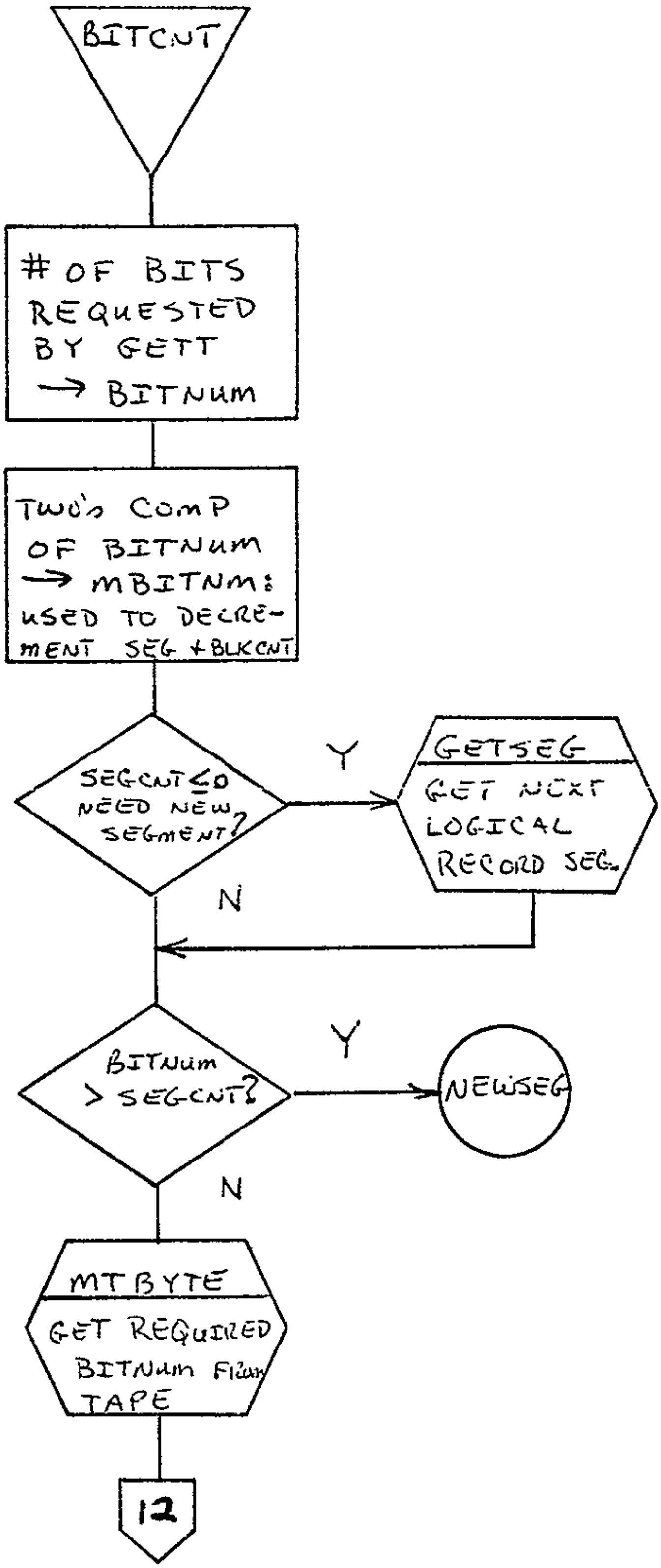

CHROUT
CONVRT
DTE TO EBCDIC CONVERSION
VCHAR
OUTPUT CHARACTER TO FILM
EXIT

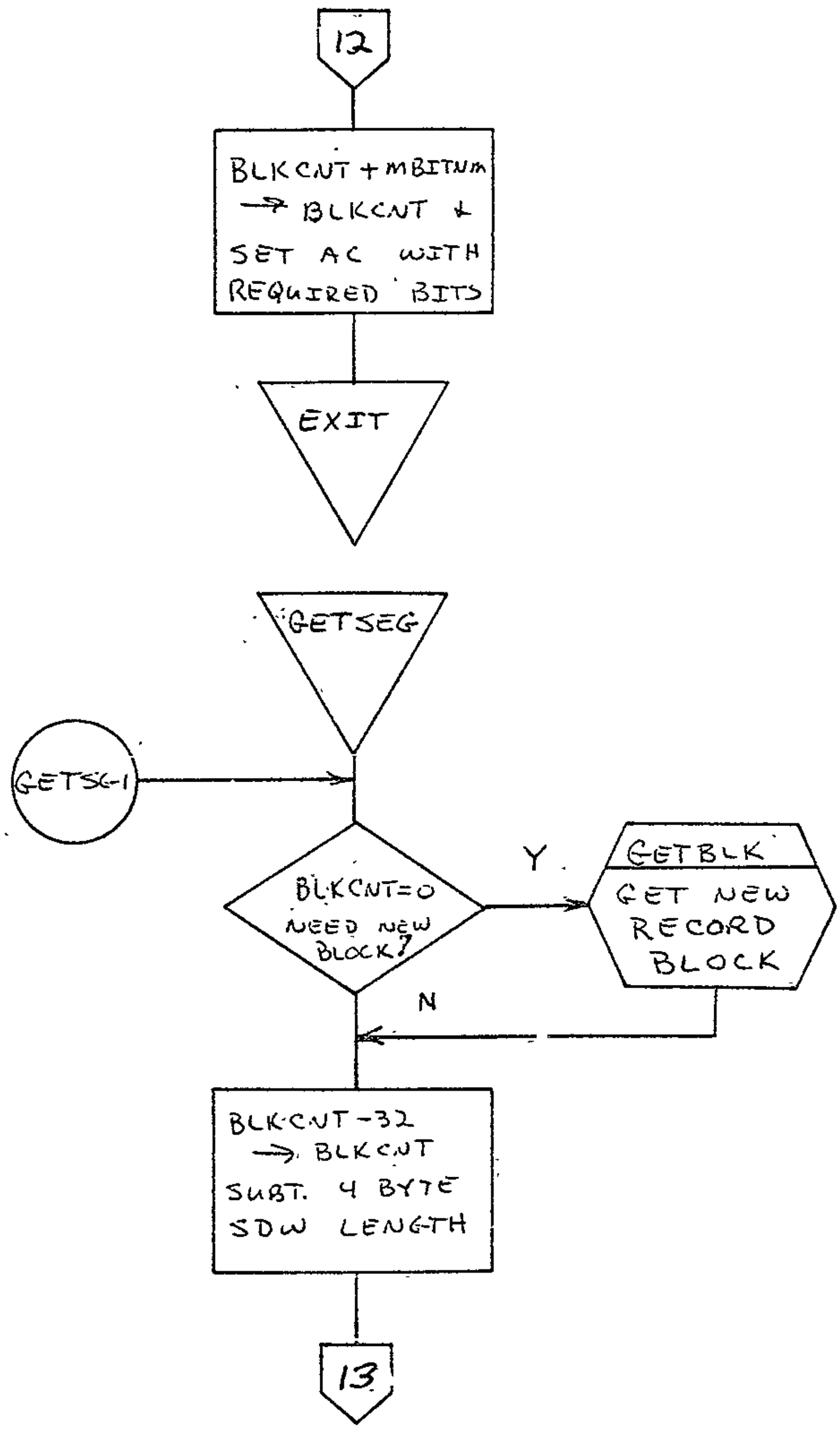


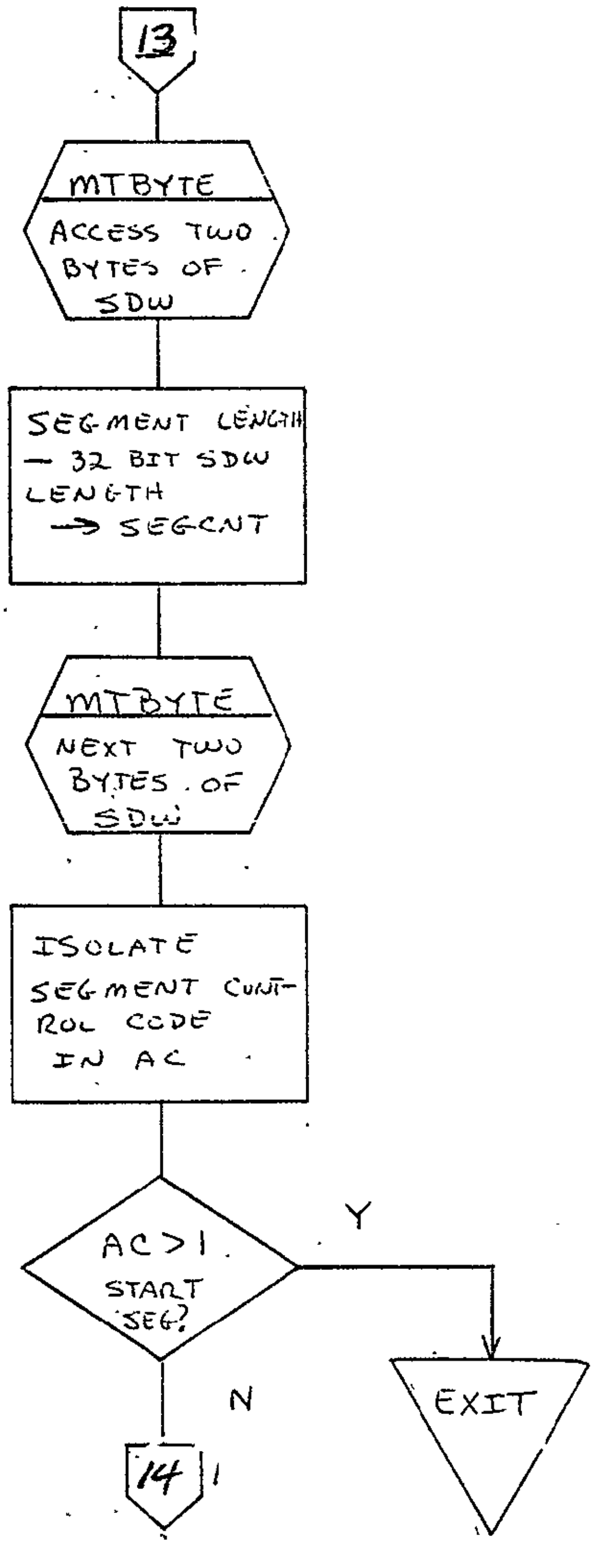
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

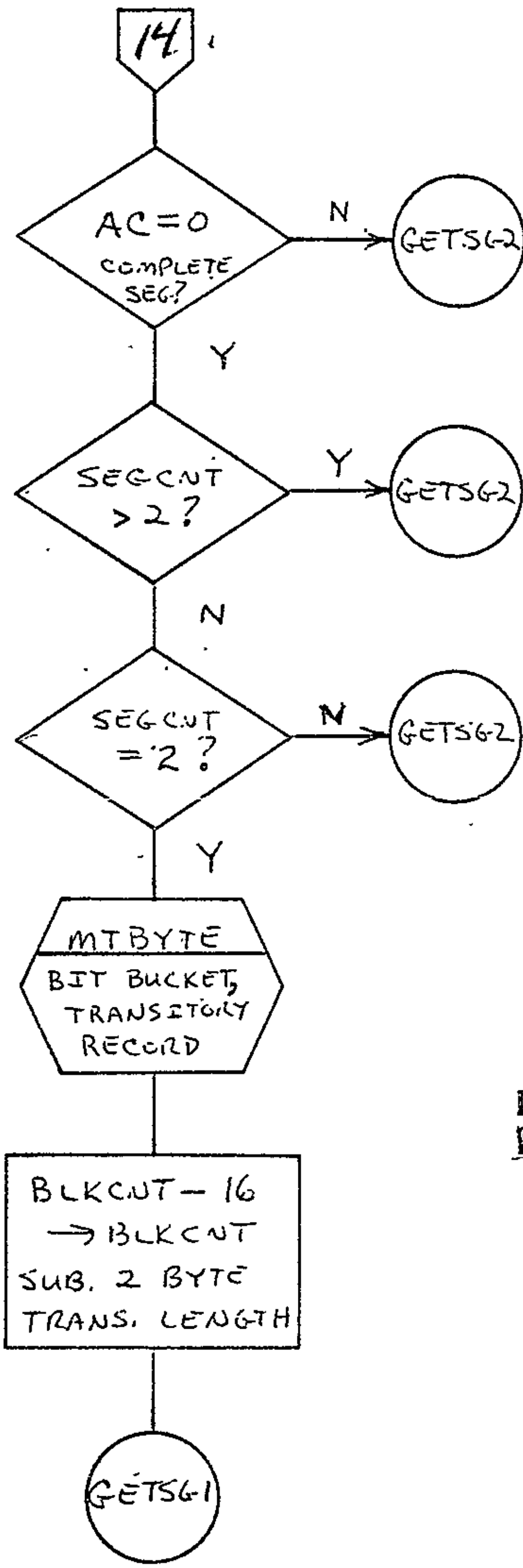

CONVRT
USE ½ DTE CHAR VALUE AS INDEX INTO DTETAB
GET WORD FROM DTETAB 2 CHARS/WORD
UPPER BYTE?
Y
SHIFT WORD TO GET UPPER BYTE
N
ISOLATE EBCDIC CHAR IN LOW AC
EXIT


NEXFRM
MNBRIT
TITLE
INTENSITY
NEXPIC
ADVANCE
FILM
MNBRIT
DATA
INTENSITY
EXIT


BITCNT
OF BITS REQUESTED BY GETT → BITNUM
TWO'S COMP OF BITNUM → MBITNM: USED TO DECREMENT SEG + BLKCNT
SEGCNT ≤ 0 NEED NEW SEGMENT?
Y
N
GETSEG
GET NEXT LOGICAL RECORD SEG.
BITNUM > SEGCNT?
Y
N
NEWSEG
MTBYTE
GET REQUIRED BITNUM FROM TAPE
12


12
BLKCNT + MBITNM → BLKCNT & SET AC WITH REQUIRED BITS
EXIT
GETSEG
GETSG1
BLKCNT=0 NEED NEW BLOCK?
Y
N
GETBLK
GET NEW RECORD BLOCK
BLKCNT - 32 → BLKCNT SUBT. 4 BYTE SDW LENGTH
13


13
MTBYTE
ACCESS TWO BYTES OF SDW
SEGMENT LENGTH — 32 BIT SDW LENGTH → SEGCNT
MTBYTE
NEXT TWO BYTES OF SDW
ISOLATE SEGMENT CONTROL CODE IN AC
AC>1 START SEG?
Y
N
EXIT
14



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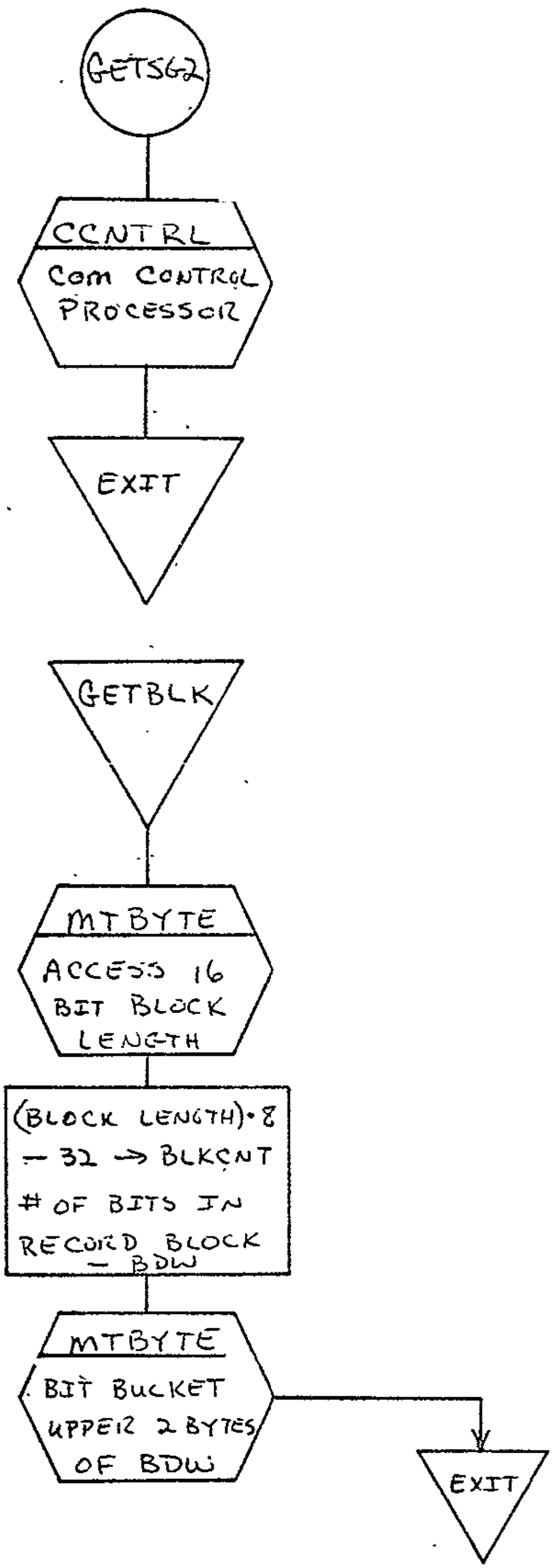
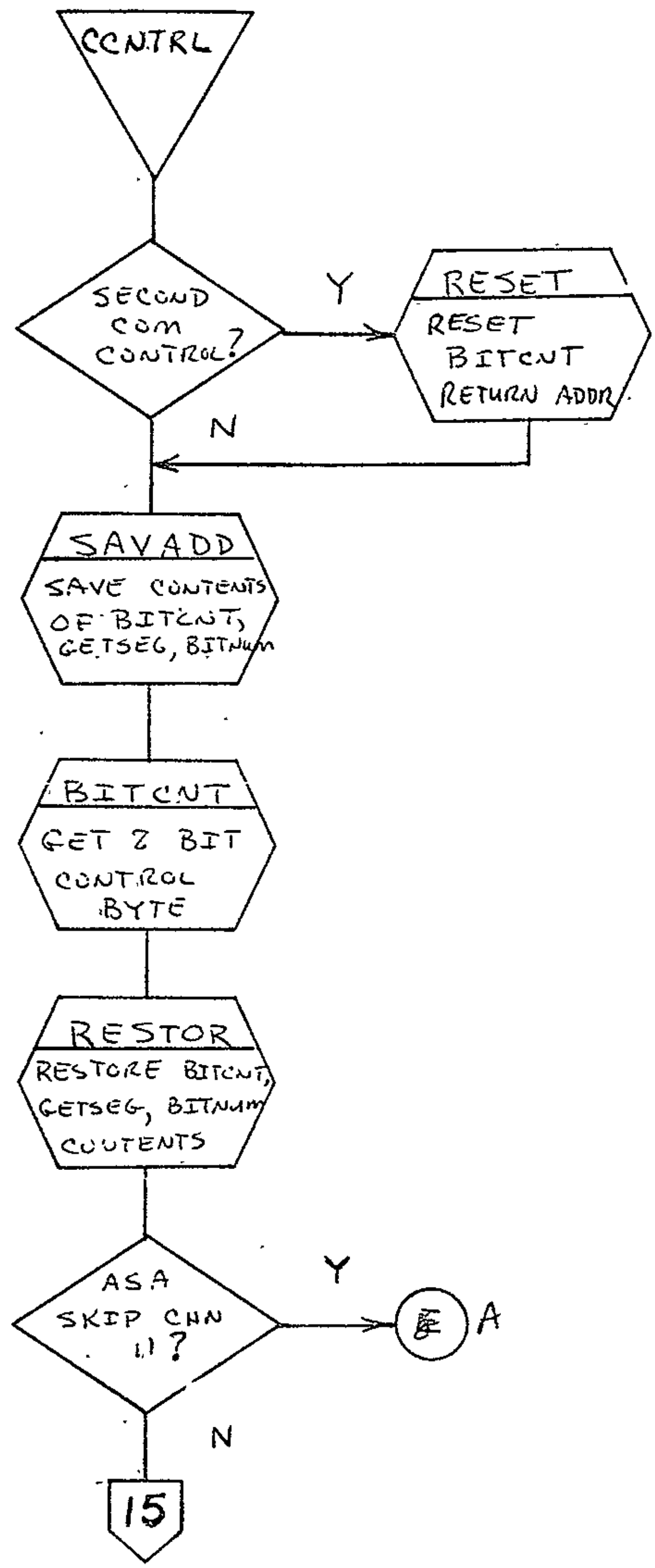
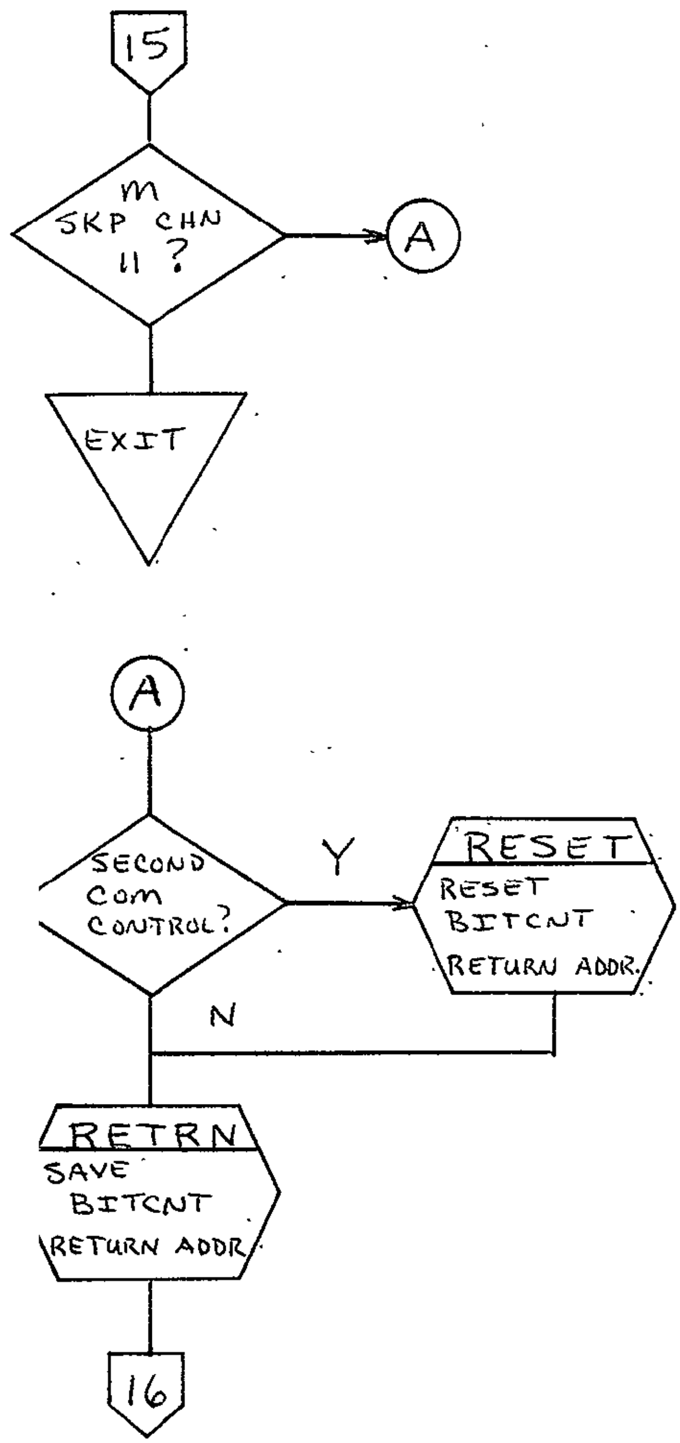
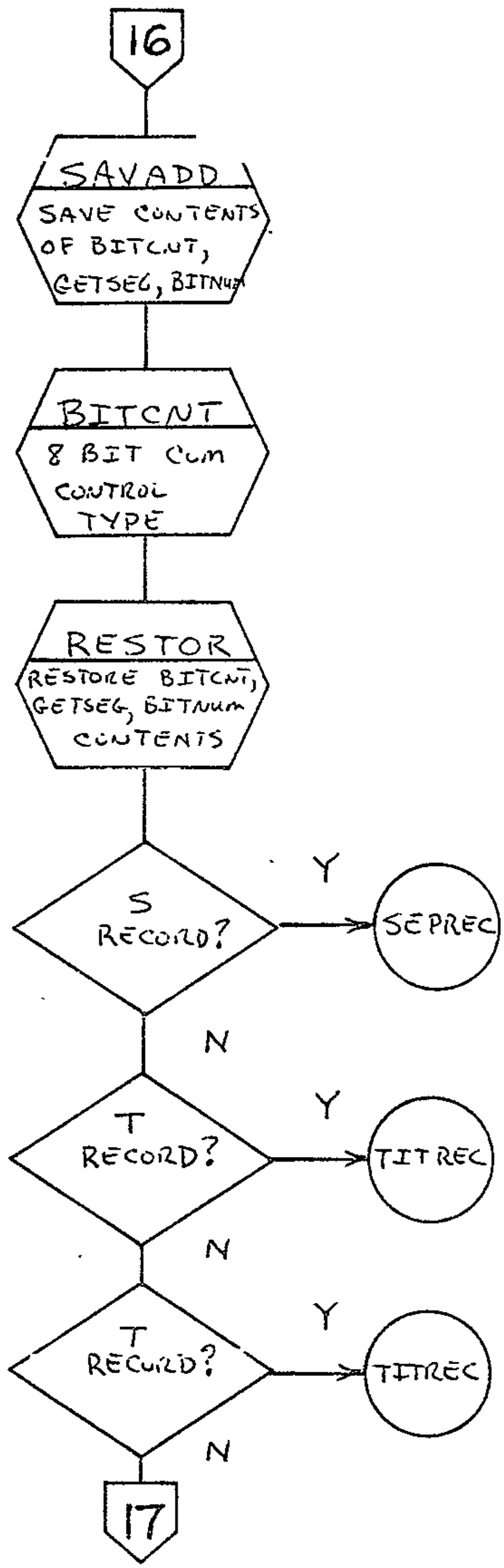
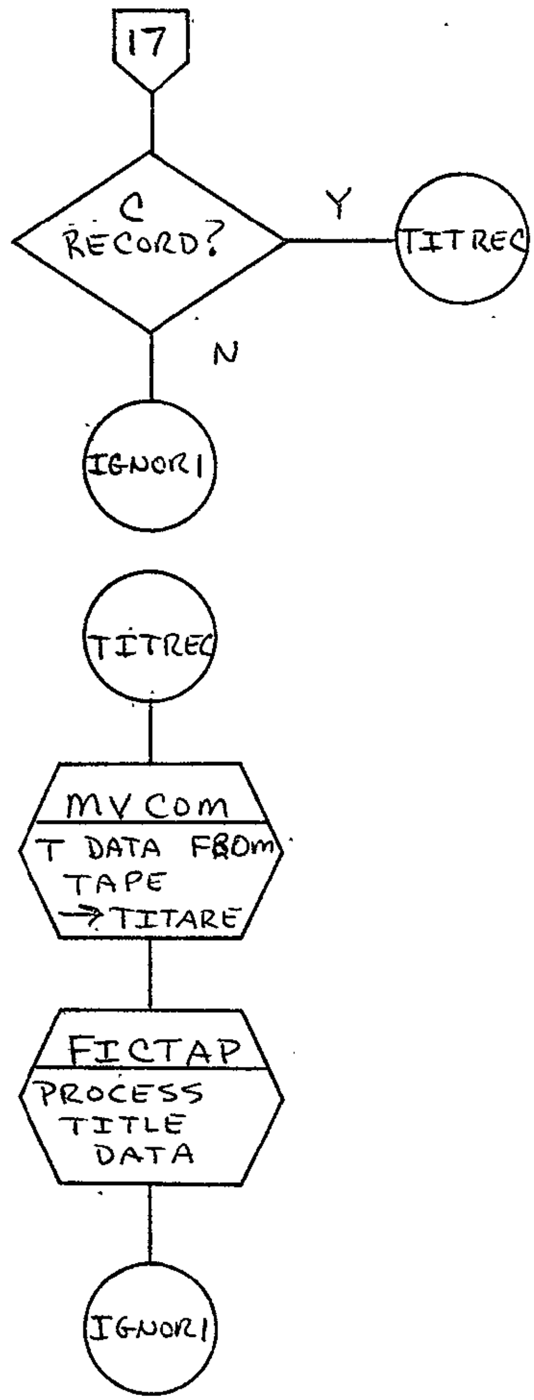
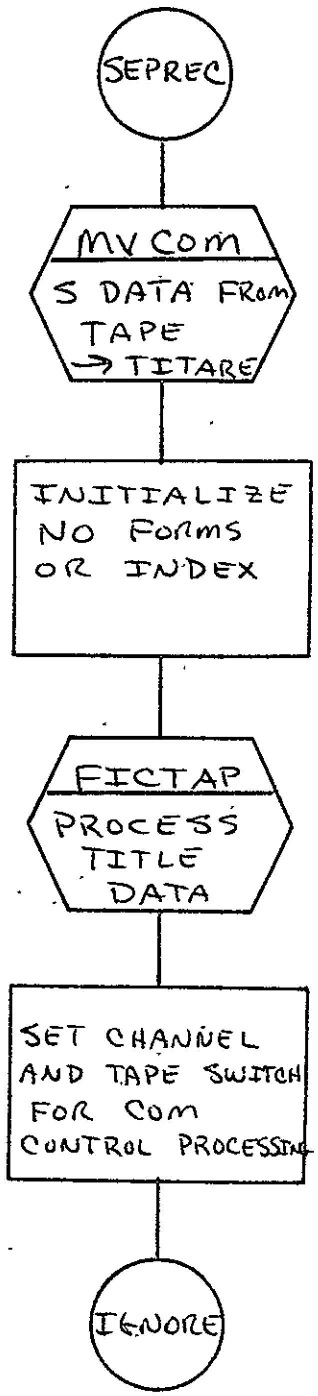

GETSG2
CCNTRL
Com CONTROL PROCESSOR
EXIT
GETBLK
MTBYTE
ACCESS 16 BIT BLOCK LENGTH
(BLOCK LENGTH)·8 − 32 → BLKCNT
OF BITS IN RECORD BLOCK − BDW
MTBYTE
BIT BUCKET UPPER 2 BYTES OF BDW
EXIT

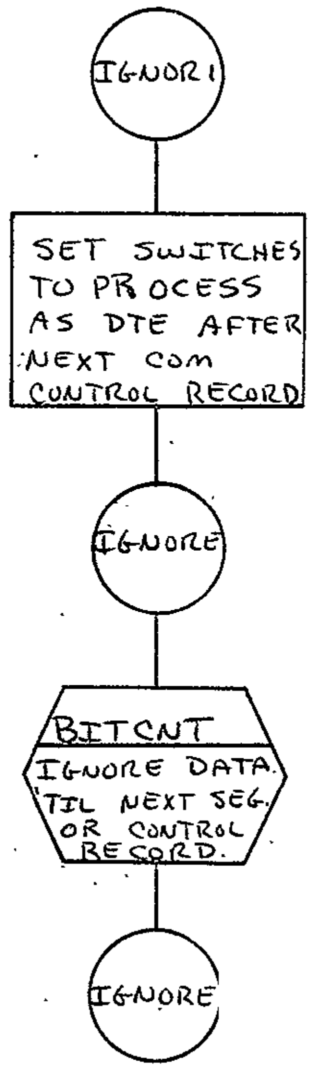

CCNTRL
SECOND COM CONTROL?
Y
RESET
RESET BITCNT RETURN ADDR
N
SAVADD
SAVE CONTENTS OF BITCNT, GETSEG, BITNUM
BITCNT
GET 2 BIT CONTROL BYTE
RESTOR
RESTORE BITCNT, GETSEG, BITNUM CONTENTS
ASA SKIP CHN 11?
Y
A
N
15

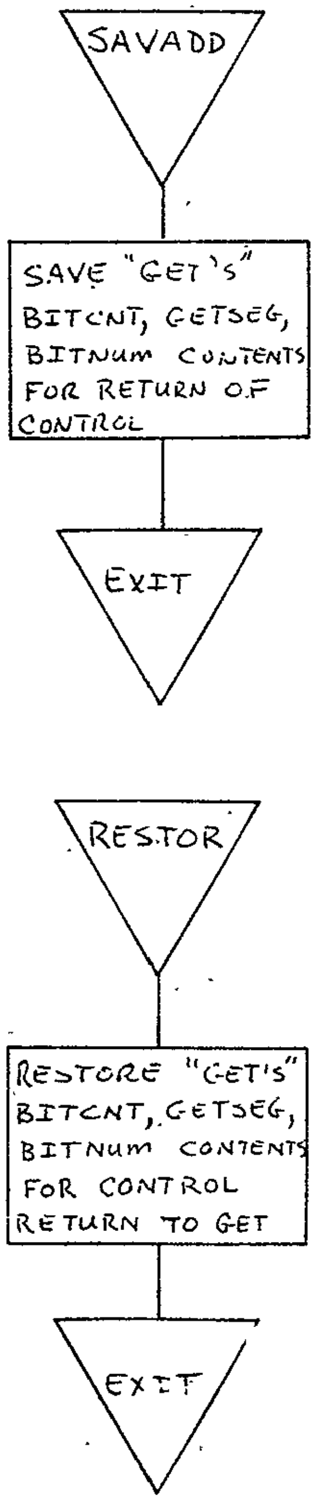

15
m SKP CHN 11?
A
EXIT
A
SECOND COM CONTROL?
Y
RESET
RESET BITCNT RETURN ADDR.
N
RETRN
SAVE BITCNT RETURN ADDR
16

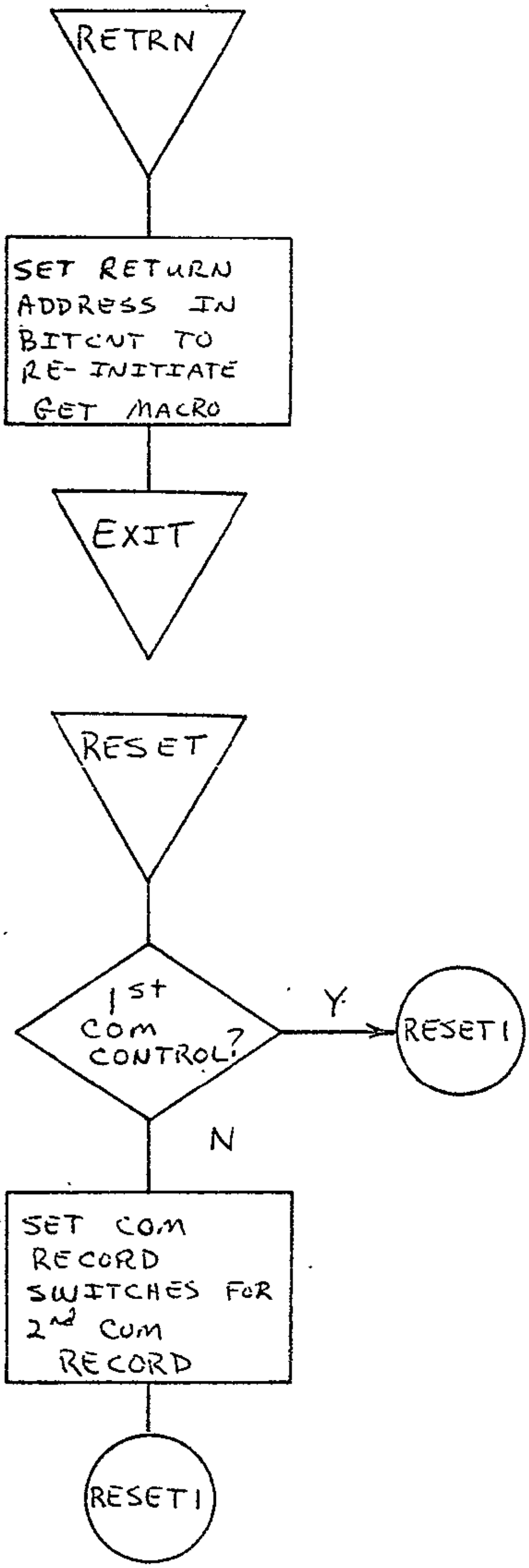

16
SAVADD
SAVE CONTENTS OF BITCNT, GETSEG, BITNUM
BITCNT
8 BIT COM CONTROL TYPE
RESTOR
RESTORE BITCNT, GETSEG, BITNUM CONTENTS
S RECORD?
Y
SEPREC
N
T RECORD?
Y
TITREC
N
T RECORD?
Y
TITREC
N
17

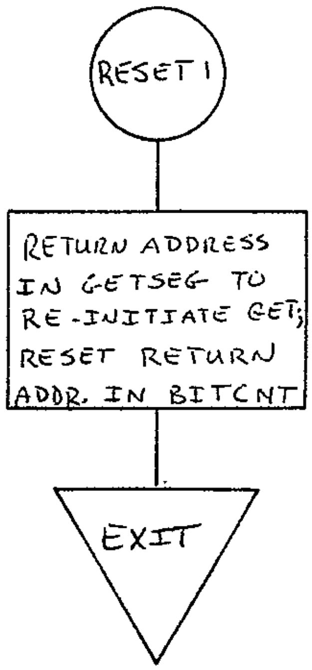

17
C RECORD?
Y
N
TITREC
IGNOR1
TITREC
MVCOM
T DATA FROM TAPE → TITARE
FICTAP
PROCESS TITLE DATA
IGNOR1

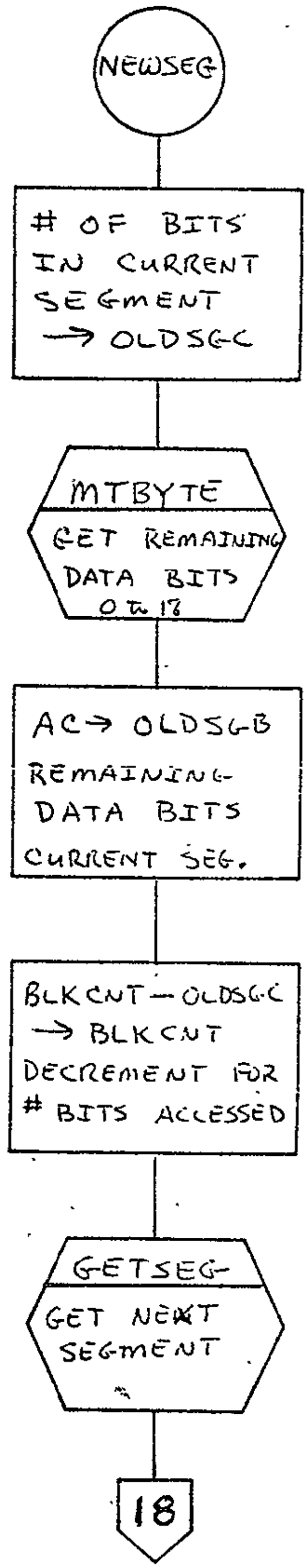

SEPREC
MVCOM
S DATA FROM TAPE → TITARE
INITIALIZE NO FORMS OR INDEX
FICTAP
PROCESS TITLE DATA
SET CHANNEL AND TAPE SWITCH FOR COM CONTROL PROCESSING
IGNORE

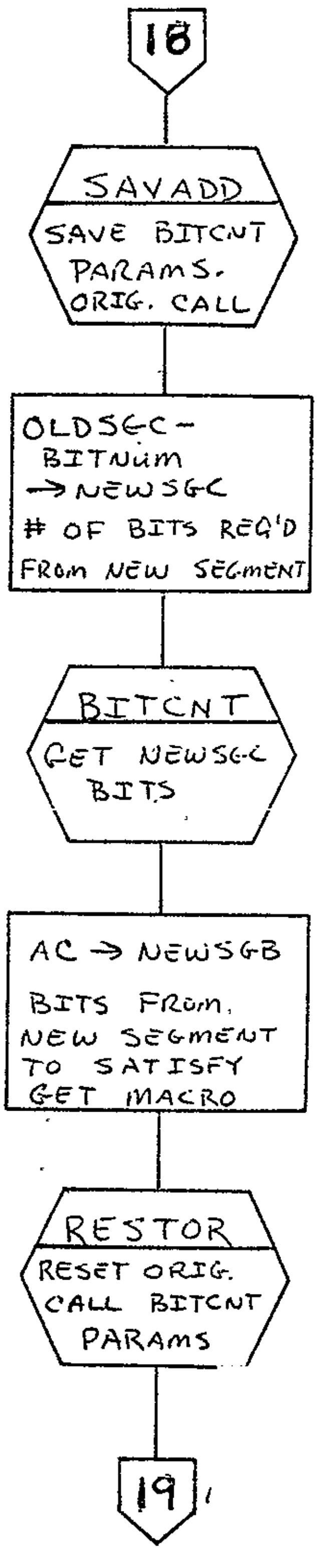

IGNOR1
SET SWITCHES TO PROCESS AS DTE AFTER NEXT COM CONTROL RECORD
IGNORE
BITCNT
IGNORE DATA TIL NEXT SEG. OR CONTROL RECORD.
IGNORE

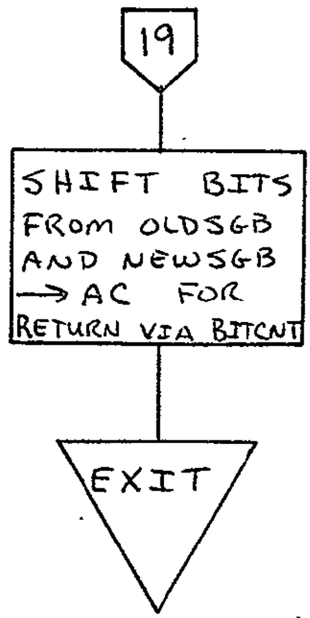

SAVADD
SAVE "GET'S" BITCNT, GETSEG, BITNUM CONTENTS FOR RETURN OF CONTROL
EXIT
RESTOR
RESTORE "GET'S" BITCNT, GETSEG, BITNUM CONTENTS FOR CONTROL RETURN TO GET
EXIT


RETRN
SET RETURN ADDRESS IN BITCNT TO RE-INITIATE GET MACRO
EXIT
RESET
1st COM CONTROL?
Y
RESET1
N
SET COM RECORD SWITCHES FOR 2nd COM RECORD
RESET1

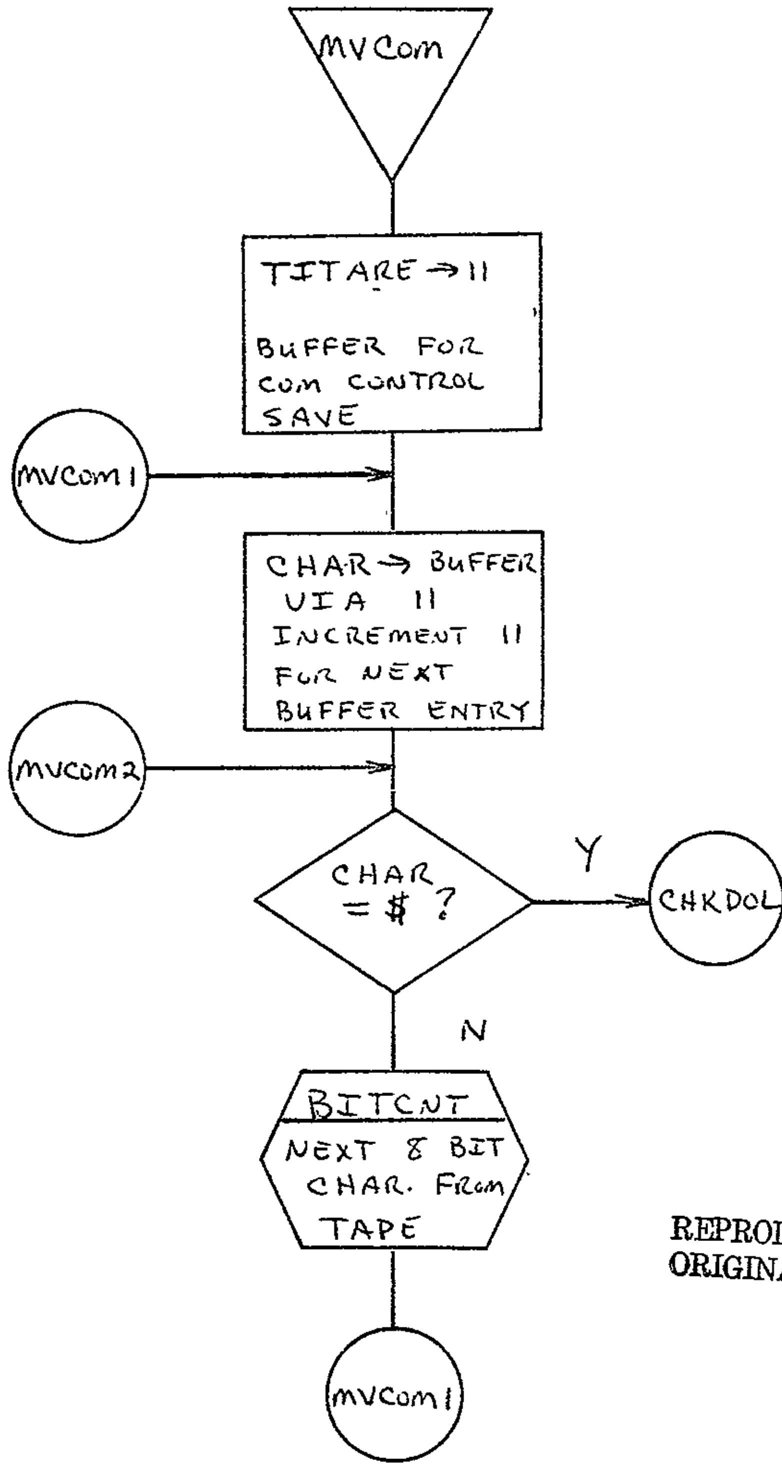

RESET 1
RETURN ADDRESS IN GETSEG TO RE-INITIATE GET; RESET RETURN ADDR. IN BITCNT
EXIT


NEWSEG
OF BITS IN CURRENT SEGMENT → OLDSGC
MTBYTE
GET REMAINING DATA BITS 0 to 17
AC → OLDSGB
REMAINING DATA BITS CURRENT SEG.
BLKCNT — OLDSGC → BLKCNT
DECREMENT FOR # BITS ACCESSED
GETSEG
GET NEXT SEGMENT
18


18
SAVADD
SAVE BITCNT PARAMS. ORIG. CALL
OLDSGC - BITNUM → NEWSGC
OF BITS REQ'D FROM NEW SEGMENT
BITCNT
GET NEWSGC BITS
AC → NEWSGB
BITS FROM NEW SEGMENT TO SATISFY GET MACRO
RESTOR
RESET ORIG. CALL BITCNT PARAMS
19


19
SHIFT BITS
FROM OLDSGB
AND NEWSGB
→ AC FOR
RETURN VIA BITCNT
EXIT

1



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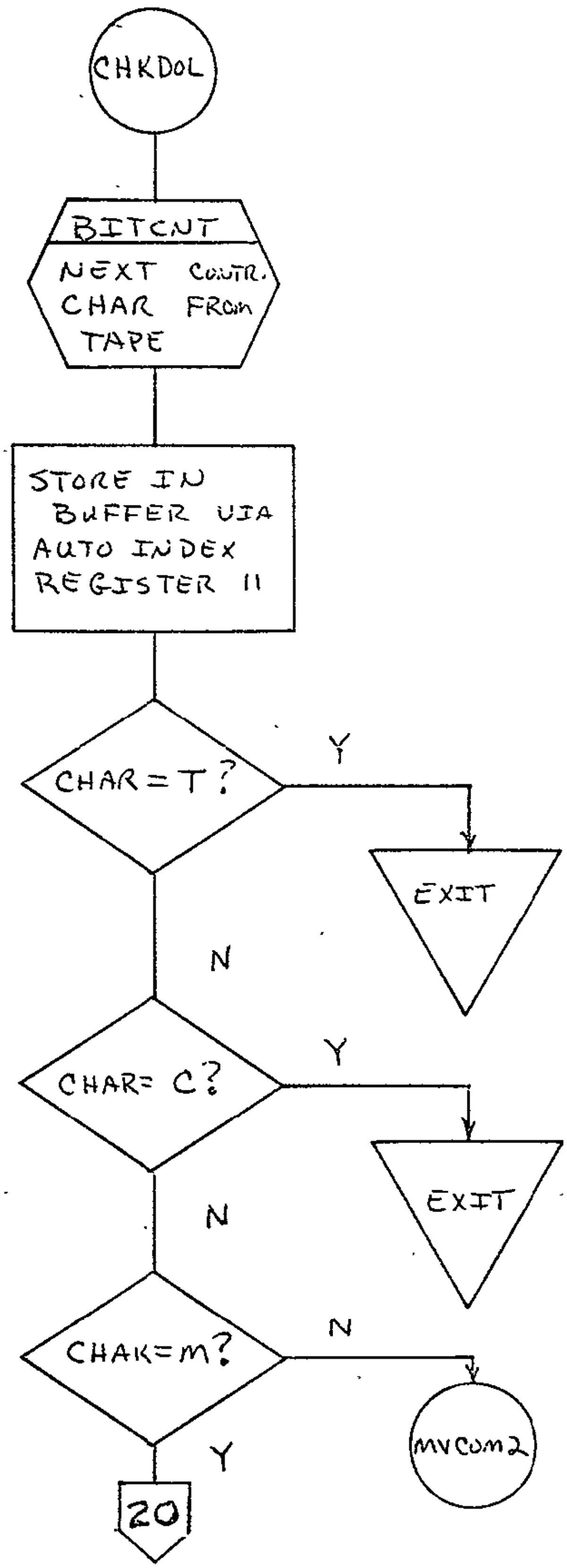
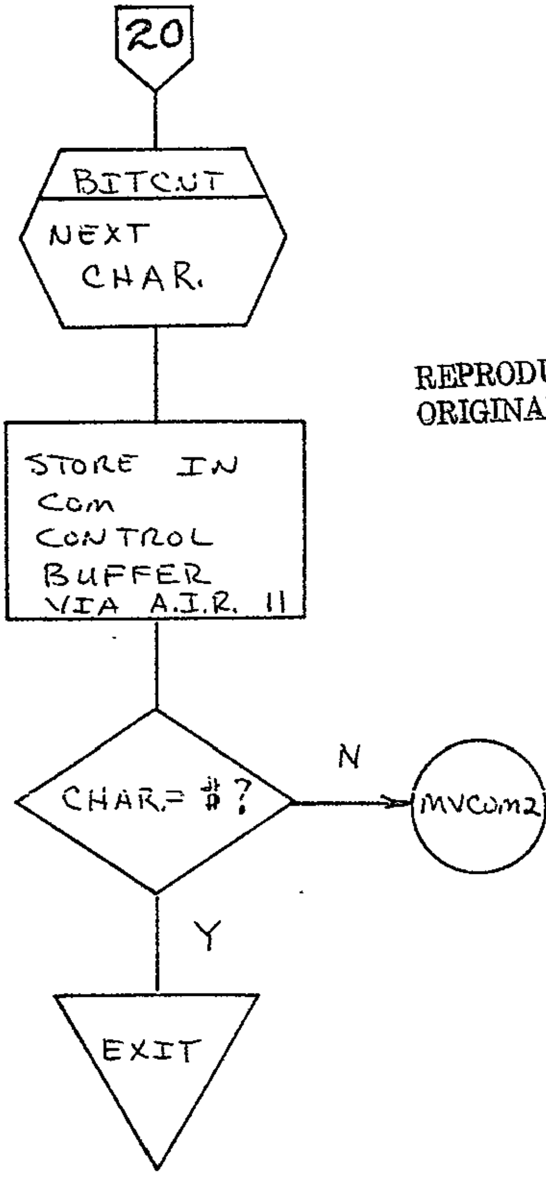
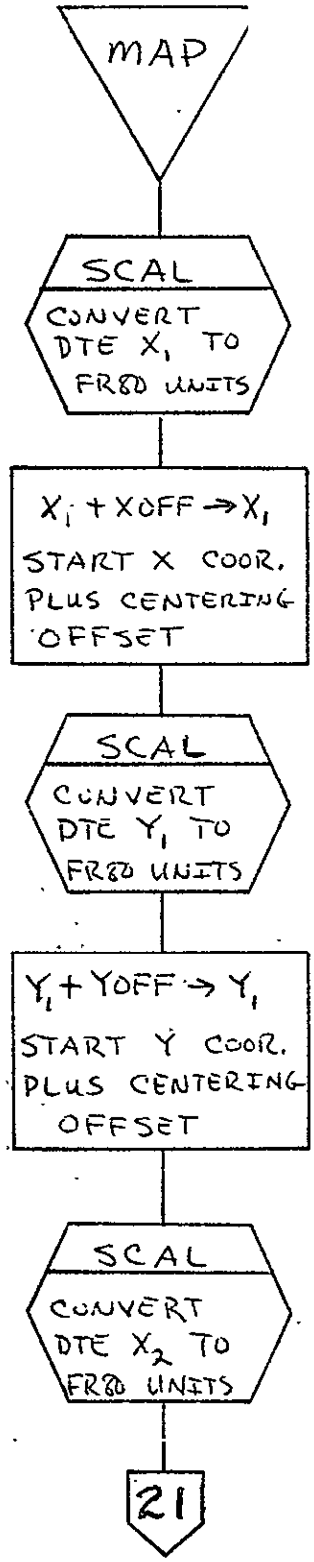
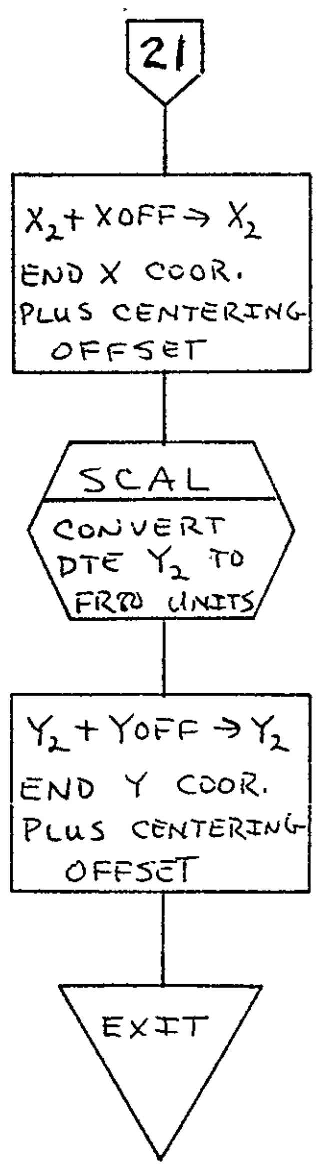
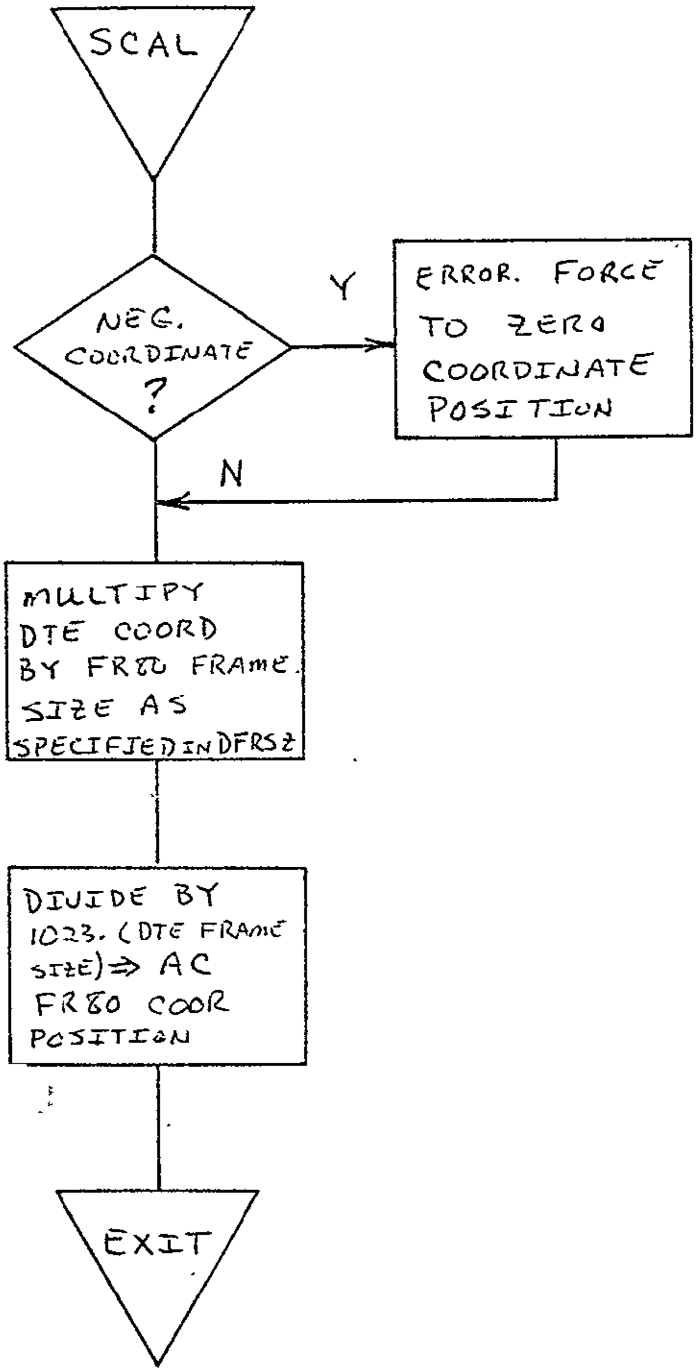

CHKDOL
BITCNT
NEXT CONTR. CHAR FROM TAPE
STORE IN BUFFER VIA AUTO INDEX REGISTER 11
CHAR = T?
Y
EXIT
N
CHAR = C?
Y
EXIT
N
CHAR = M?
N
MVCOM2
Y
20


20
BITCUT
NEXT CHAR.
STORE IN COM CONTROL BUFFER VIA A.I.R. 11
CHAR = #?
N
MVCOM2
Y
EXIT


MAP
SCAL
CONVERT DTE X_1 TO FR80 UNITS
$X_1 + XOFF \rightarrow X_1$
START X COOR. PLUS CENTERING OFFSET
SCAL
CONVERT DTE Y_1 TO FR80 UNITS
$Y_1 + YOFF \rightarrow Y_1$
START Y COOR. PLUS CENTERING OFFSET
SCAL
CONVERT DTE X_2 TO FR80 UNITS
21


21
X2 + XOFF → X2
END X COOR.
PLUS CENTERING
OFFSET
SCAL
CONVERT
DTE Y2 TO
FRD UNITS
Y2 + YOFF → Y2
END Y COOR.
PLUS CENTERING
OFFSET
EXIT


SCAL
NEG. COORDINATE ?
Y
ERROR. FORCE TO ZERO COORDINATE POSITION
N
MULLTIPY DTE COORD BY FR80 FRAME SIZE AS SPECIFIED IN DFRSZ
DIVIDE BY 1023. (DTE FRAME SIZE) ⇒ AC FR80 COOR POSITION
EXIT

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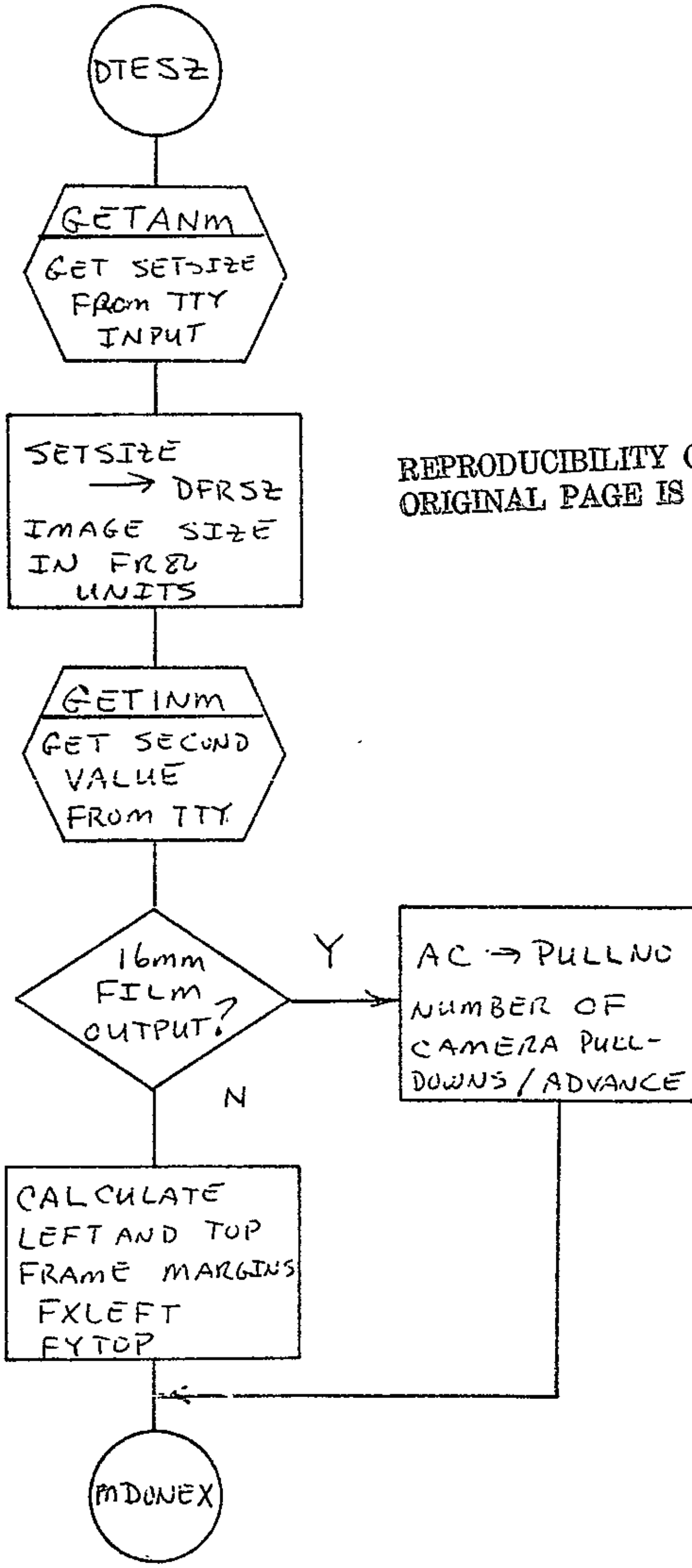
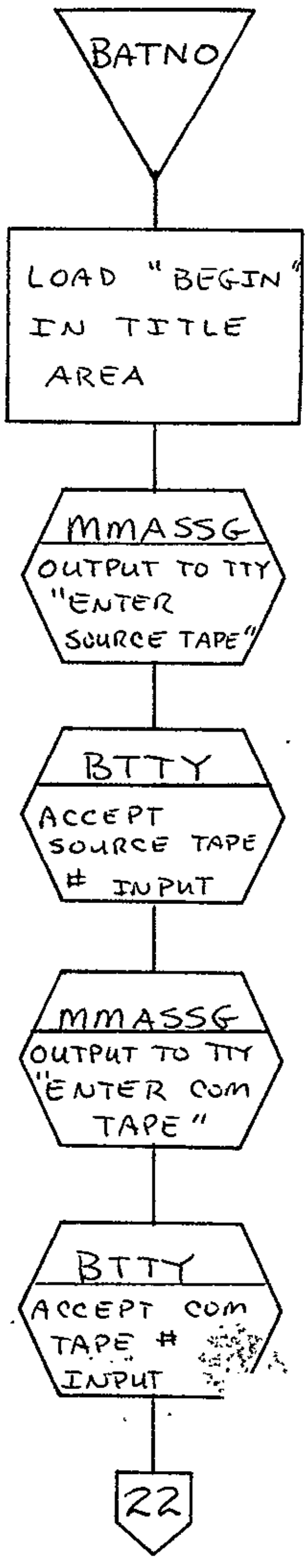
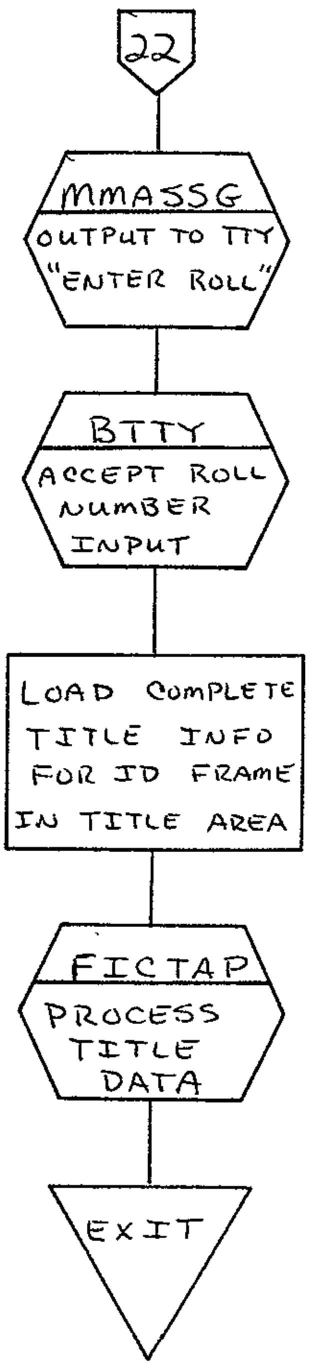
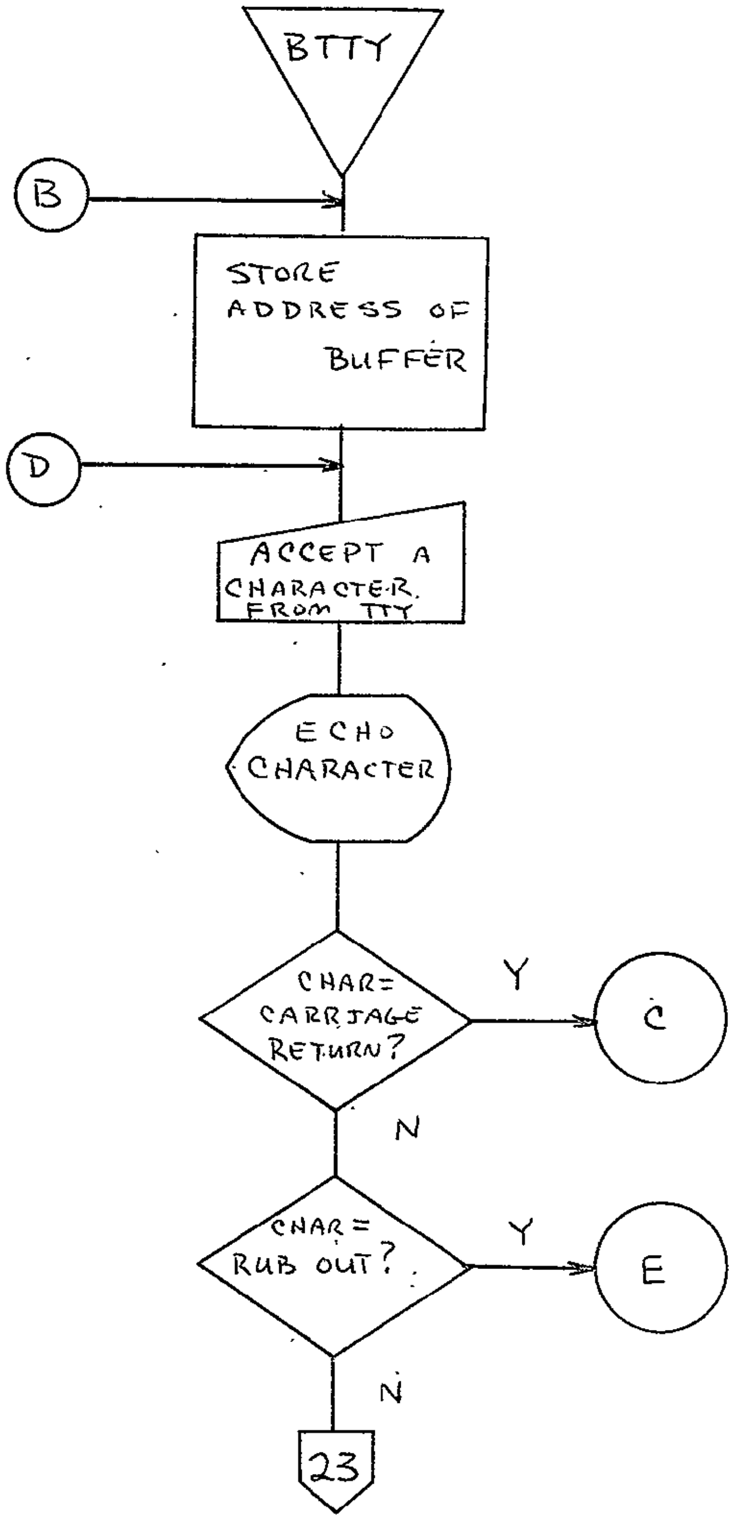
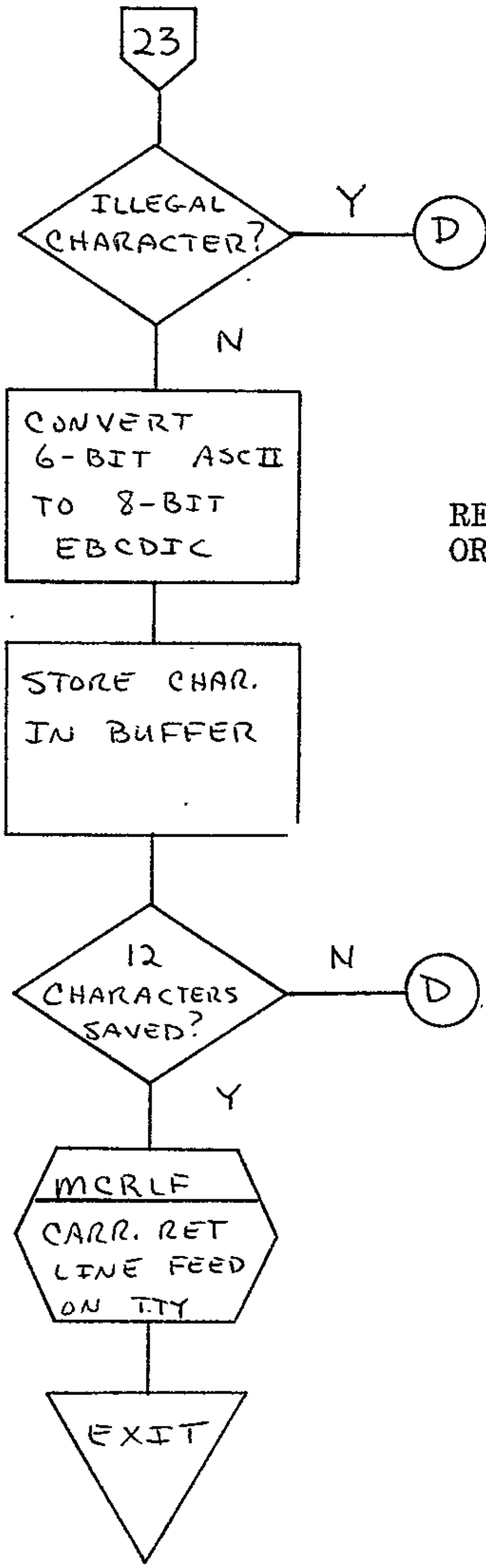


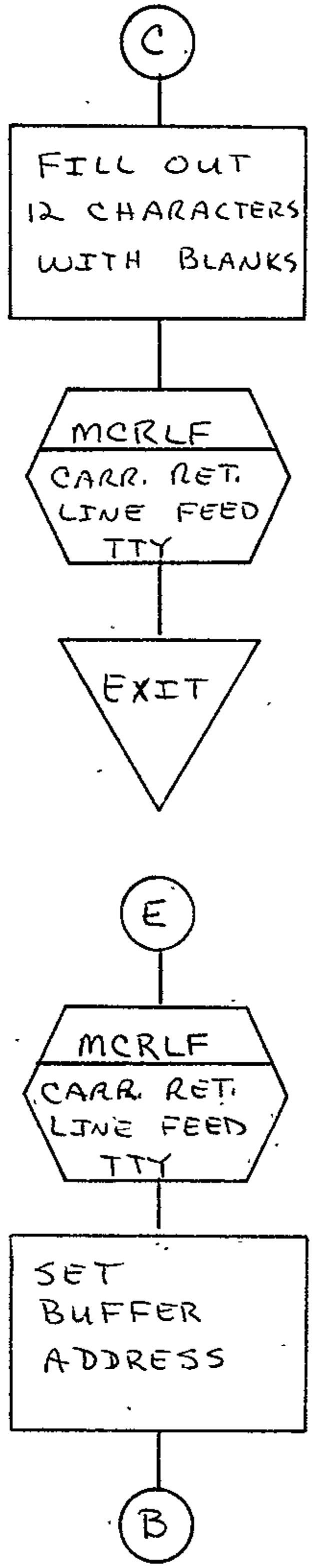

BATNO
LOAD "BEGIN" IN TITLE AREA
MMASSG
OUTPUT TO TTY "ENTER SOURCE TAPE"
BTTY
ACCEPT SOURCE TAPE # INPUT
MMASSG
OUTPUT TO TTY "ENTER COM TAPE"
BTTY
ACCEPT COM TAPE # INPUT
22

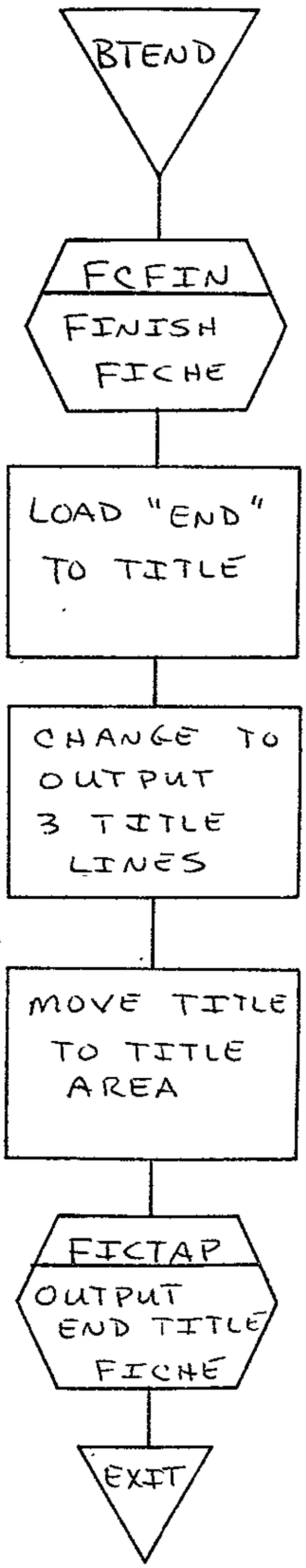

22
MMASSG
OUTPUT TO TTY
"ENTER ROLL"
BTTY
ACCEPT ROLL
NUMBER
INPUT
LOAD COMPLETE
TITLE INFO
FOR ID FRAME
IN TITLE AREA
FICTAP
PROCESS
TITLE
DATA
EXIT

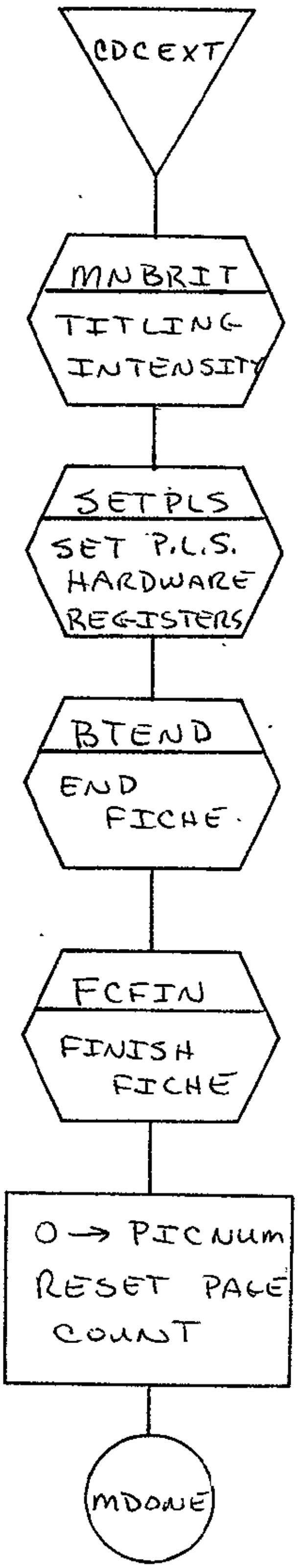

BTTY
B
STORE ADDRESS OF BUFFER
D
ACCEPT A CHARACTER FROM TTY
ECHO CHARACTER
CHAR= CARRIAGE RETURN?
Y
C
N
CHAR= RUB OUT?
Y
E
N
23



REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR


C
FILL OUT
12 CHARACTERS
WITH BLANKS
MCRLF
CARR. RET.
LINE FEED
TTY
EXIT
E
MCRLF
CARR. RET.
LINE FEED
TTY
SET
BUFFER
ADDRESS
B


BTEND
FCFIN
FINISH FICHE
LOAD "END" TO TITLE
CHANGE TO OUTPUT 3 TITLE LINES
MOVE TITLE TO TITLE AREA
FICTAP
OUTPUT END TITLE FICHE
EXIT


CDCEXT
MNBRIT
TITLING
INTENSITY
SETPLS
SET P.L.S.
HARDWARE
REGISTERS
BTEND
END
FICHE.
FCFIN
FINISH
FICHE
0 → PICNUM
RESET PAGE
COUNT
MDONE

2.6 COMA PDP 11/45 PRINT PROCESSOR FOR 16 mm FILM (PDP16)

2.6.1 Background

A. Author. V. Pote, Aeronutronic Ford Corp.

B. Intent. The requirements for these programs are specified in SISO-generated document SH-25073. PDP16 is requested when a PDP 11/45 FORTRAN generated print tape has been submitted for data to be output to 16 mm film.

C. Program History

1. Production Tape Date. 17 September 1973
2. Author. V. Pote
3. Authorization. EO-165F
4. Test Cases. Test tape specification SH-25713
5. Revisions. Reference Appendix B, paragraph B-6.

2.6.2 Introduction

2.6.2.1 Hardware Requirements

- FR80 with 12K memory
- 9-track tape unit
- 16 mm unsprocketed camera.

2.6.2.2 Software Requirements.

The following files, found in I.I.I.'s SYM Directory, are required:

III109	III196	III147	III161 GO
III166	III164	III162	
III185	III163	III161	

2.6.2.3 Assembly Parameters

A. 9-TRACK. If 1, indicates data will be coming from a 9-track tape drive.

B. MUMBLE. If 1, defines system configuration for output to the teletype.

C. FONT. If 0, defines standard I.I.I. character font III164.

D. LOCASE. If 1, defines lower case characters in the character set.

E. IIISET. If 1, assembles a dispatch tube for I.I.I. standard character codes.

F. TWOBUF. If 1, defines two magnetic tape buffers for higher throughput.

G. EOFP. If 1, defines end-of-file processing code is to be inserted.

H. BIGBUF. If 0, defines maximum amount of features with minimum buffer space.

I. MTSIZE. Magnetic tape buffer size (= 1001).

J. MTTSIZ. Teletype buffer size (= 210).

K. FTYPE. Camera indicator (= 16 mm).

L. MANYUP. If 1, defines code for multiple images per frame for 105 mm microfiche.

M. CAMNUM. If 2, indicates the 16 mm unsprocketed camera is to be used.

2.6.2.4 Operator Commands. The following commands shall be used for the PDP16 execution.

```
PDP16$J
*MONITOR (Returned by FR80)
GO/)
XXXXXXXXX ENTER TAPE NBR
(Operator enters tape No. after this MSS
END JOB/) (when EOF has been returned)
```

2.6.3 Analysis

2.6.3.1 Major Control System

A. Description. The mainline code for this processor begins at BEGIN. The program first initializes all storage used by the program in order to make the program reusable. All flags and instruction switches are set to their initial values. Next, a FRSPIC is done to initialize the camera, and CURBUF, NEXBUF and PBUFSZ are initialized to current buffer address, alternate buffer address, and buffer size, respectively. Then control is passed to the III routine MTRINI to initialize the tape handler. Upon return, control is passed to the internal subroutine, JSEP, to interpret the tape label and place it on film as the job separator. JSEP first utilizes the internal subroutine ZRD50 to convert each of the first three words in the 14-byte header from RAD50 format to teletype ASCII, and then goes to an internal subroutine, NXTPC, which effects a NEXPIC and advances the film one frame. The III subroutine DRWCHR is utilized to draw the nine characters on the film in the case of 16 mm filming.

After the job separator has been processed, the main loop of the program is entered at GETCH. First the end-of-buffer codes are inserted at the end of the primary and secondary buffers; then the interrupt condition is enabled in VCHTAB to halt on the characters for end-of-buffer or carriage return. An initial dispatch address is calculated and the high-speed character generator is invoked by calling the subroutine QHSGO. Upon return from QHSGO, the character code which caused the interrupt together with the next two character codes are extracted from the input tape buffer by calling subroutine EXDSP. If sense switch 12 is up and sense switch 13 has changed from the previous position, the high-speed character generator is reinvoked to display the current line being generated. Otherwise, processing continues upon the three codes which caused the interrupt.

First, the carriage control code (the third character) is checked for validity. If the code is invalid, a search is made for the next carriage return code and thus a new carriage control code. A single-space carriage control code causes a carriage return line feed to be executed. A double-space carriage control code causes a double carriage return/line feed to be executed. A page eject carriage con trol code causes a double carriage return/line feed to be executed, and subroutine NXTPC to be called to advance the film by one frame. The X and Y coordinates are then recalculated.

After the appropriate action has been taken based on the carriage control code, a new dispatch address is calculated and the program returns to GETCH to resume the high-speed character generator.

B. Input/Output

1. Input. Data will be input from a 9-track tape drive in variable length lines and physical record size of 512 bytes. The tape will contain a 14-byte header record containing in the first three words the table label in RAD50 format.

2. Output. Output of data is to 16 mm film. Page size is 64 lines maximum; line length is 132 lines maximum.

3. Error Message Output. ILLEGAL FORM is output when a form number greater than four has been requested.

C. Linkages

1. External

Routine	Program	Routine	Program
MTRINI	III163	GETT	III163
NEXPIC	III166	DRWVEC	III162
SETPLS	III166	SETXYX	III166
KYBLIS	III166	SETHPS	III162
FRSPIC	III166	SETTLS	III162
DRWCHR	III162	MTBYTE	III163

2. Internal Routines

FLMOUT	JSEP	GETC	TELKBW	QHSGO	JSEP2
NXTPC	CUTMAK	PUTC	OUTTY	EXDSP	PLCE
PLSET	ZRD50	TELKBR	INTTY	SETVCH	

2.6.3.2 Subroutines

A. FLMOUT. Advances film 10 frames on end-of-file and automatically outputs the job separator information. Calling sequence: JMS FLMOUT (in III163).

B. NXTPC. There are no parameters passed to NXTPC. NXTPC will advance the film to a new frame and reset the X and Y coordinates for both forms and text to the top of the page. Before the advance, if forms were requested, NXTPC will call PPAGE to flash the form. Calling sequence: JMS NXTPC.

C. PLSET. Sets the delta X and Y, the intensity and the spot size, and calls SETPLS to initialize the DAC registers. Calling sequence: JMS PLSET.

D. JSEP. Reads the header label from the tape and decodes it from RAD50 format to ASCII. Using JSEP2, it then advances the film and if 16 mm film is being used, draws the nine ASCII characters on the film in eyeball-sized letters. Calling sequence: JMS JSEP.

E. CUTMAK. Outputs cutmarks. Calling sequence: JMS CUTMAK.

F. ZRD50. Converts the contents of the AC from RAD50 to three seven-bit ASCII characters. Calling sequence: JMS ZRD50.

G. GETC. Obtains a character from a specified line buffer in a specified position and places the character in the AC. The cell, LI32AD, should be loaded with the address of the line buffer and CHPOS should be loaded with the character position upon entry. Calling sequence: JMS GETC.

H. PUTC. Places the character contained in the AC into a specified line buffer at a specified character position. LI32AD should contain the line buffer address and CHPOS should contain the character position. Calling sequence: JMS PUTC.

I. TELKBR. Reads a character from the teletype and places it in the AC. Calling sequence: JMS TELKBR.

J. TELKBW. Writes the character contained in the AC to the teletype. Calling sequence: JMS TELKBW.

K. OUTTTY. Outputs a line to the teleprinter. The line buffer address should be loaded into the AC before entry, and the line buffer should be formatted in standard 9-track buffer format. The octal code 377_8 denotes the end of the buffer. Calling sequence: JMS OUTTTY.

L. INTTY. Inputs a line from the teletype. Upon entry, the AC should contain the line buffer address. The line buffer will be formatted in standard 9-track buffer format. A carriage return will terminate the input. Calling sequence: JMS INTTY.

M. QHSGO. Invokes high-speed character generator from specified dispatch address and returns halt interrupt information. Calling sequence: JMS QHSGO.

N. EXDSP. Extracts character code from specified buffer position. The buffer position is specified in the AC in the form of a dispatch address. Calling sequence: JMS EXDSP.

O. SETVCH . Sets high-order bit of the character positions indicated in the specified list. Calling sequence: JMS SETVCH.

P. JSEP2. Advances the film and draws nine ASCII characters on the film in eyeball-sized letters. Calling sequence: JMS JSEP2.

Q. PLCE. Places last three digits of the tape number in the output. Calling sequence: JMS PLCE.

2.6.3.3 Constants and Variables

A. Internal

1. ADVI. When set, indicates to subroutine FLMOUT to advance film.

2. ALPHX. Text of initial X DAC register.

3. ALPHY. Text of initial Y DAC register.

4. CHPOS. Contains the character position of the line buffer.

5. CHRCNT. Location containing the number of characters that are to be used in the index frame.

6. CLDELX. Text X delta in scope points.

7. CLDELY. Text Y delta in scope points.

8. CLRSIZ. Text character size.

9. CURBUF. A word containing the address of the buffer currently being used.

10. ERFLAG. A flag that when set to zero indicates that the Error Form Flag is to be checked.

11. ERFMFL. Error Form Flag.

12. FLASSW. A flag used to determine if a form is to be flashed.

13. FOLFTX. Location containing the beginning raster point (X coordinate) for a form.

14. FOTOPY. Location containing the beginning raster point (Y coordinate) for a form.

15. FRMINP. Contains address of first form.

16. FRMPTR. Address of form to be flashed.

17. FRMTAB. Six-word table with each word giving the beginning address of a form.

18. IFLG. First-time flag for subroutine FLMOUT.

19. LEFTXX. Location containing the beginning X coordinate for a line of print.

20. LI32AD. Contains the address of the line buffer.

21. LINCNT. A word containing the number of lines that have been output.

22. LNBUF. Principal line buffer used in formatting text data.

23. NEWTOP. Location containing the Y coordinate of the line to be output.

24. NEXBUF. Word containing the address of the next buffer to be used.

25. REM. Location containing the remainder which indicates which byte of the word is to be used.

26. SAVIRM. Temporary location.

27. SPCNUM. Location containing the raster size for the X coordinate.

28. STOCSW. Flag used to initialize the indexing routine.

29. TEMP. Temporary reserved location used as a scratch work area.

30. TOPYY. Location containing the beginning raster point (Y coordinate) for all numbers which have been processed.

31. VCHAR. Location used to store digits temporarily until all numbers have been processed.

32. XINDX. Word containing the character number on which the indexing is to start.

33. YINDX. Location containing the line number that is to be used in the index frame.

B. External

1. CHDELX. Word used to set the delta X.

2. CHDELY. Word used to set the delta Y.

3. CHRSIZ. Contains the character size.

4. FRMNUM. Word containing the form number currently being used.

5. IFLASW. Flag used to determine if the index form is to be flashed.

6. INSXXW. Flag used to determine if indexing has been requested.

7. MAXTRW. When zero, indicates the T record has not yet been processed.

8. MTCNT. Word containing the number of words yet to be processed from one buffer (negative).

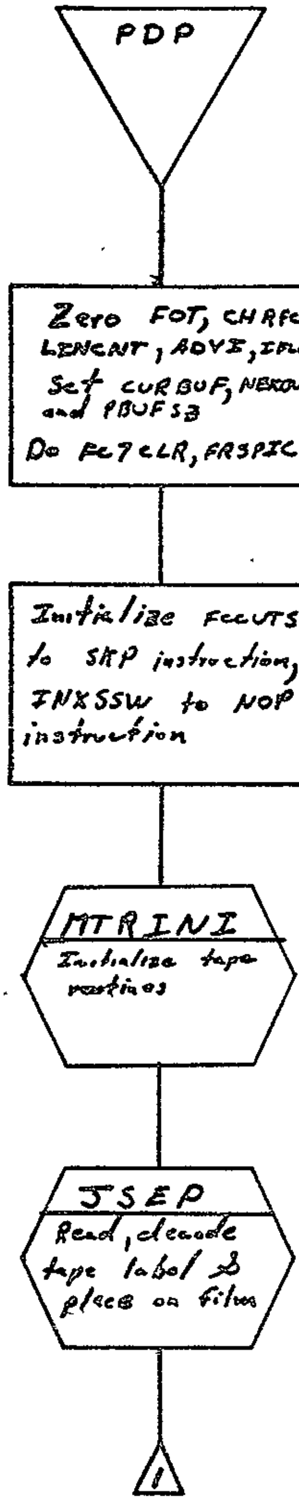
9. MTPTR. Word containing the address of the word in the buffer to be processed next.

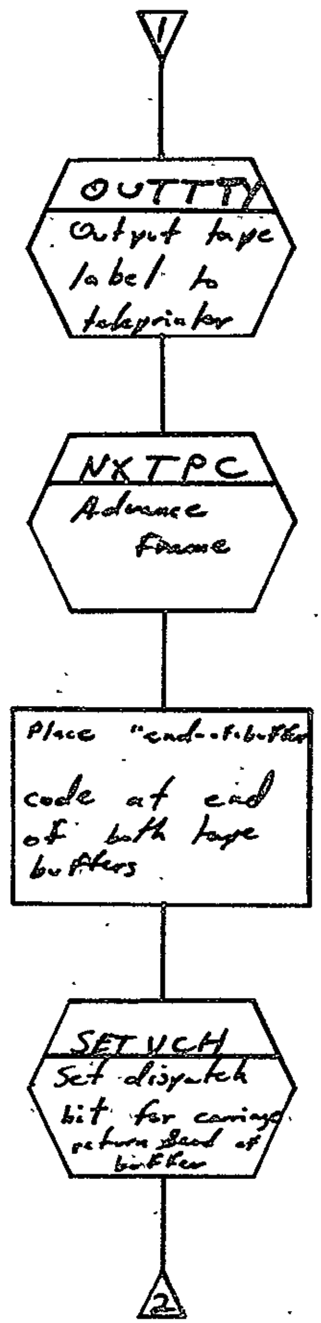
10. PBUFSZ. Word containing the length of the tape buffers.

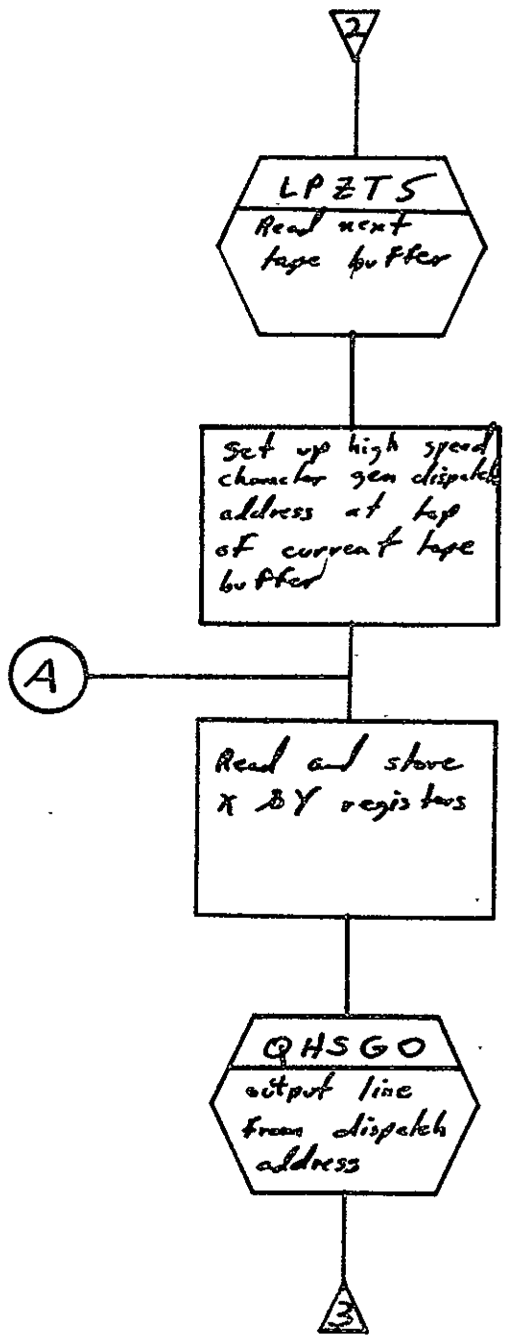
11. RECPIN. Contains intensity to be used.

12. RECSPT. Contains spot size.

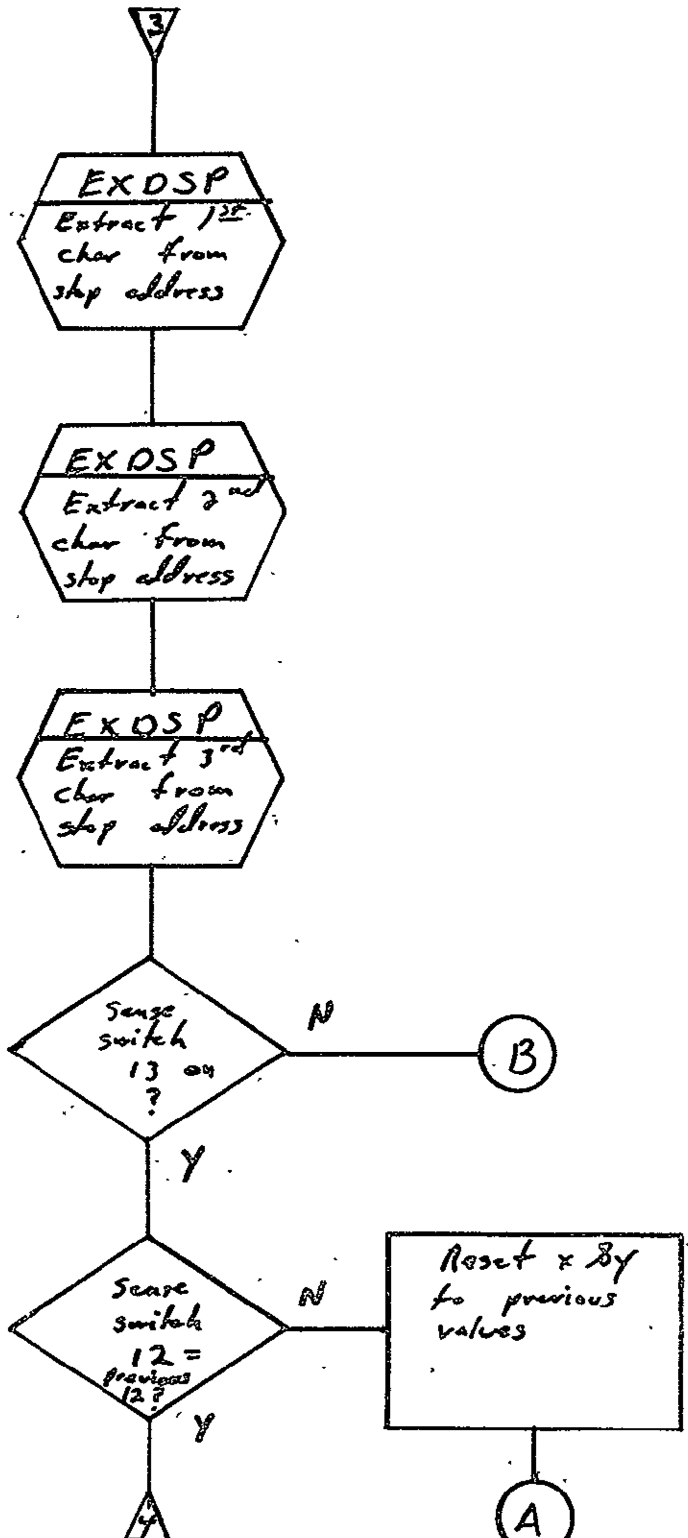
2.6.3.4 Flow Charts. See following pages.

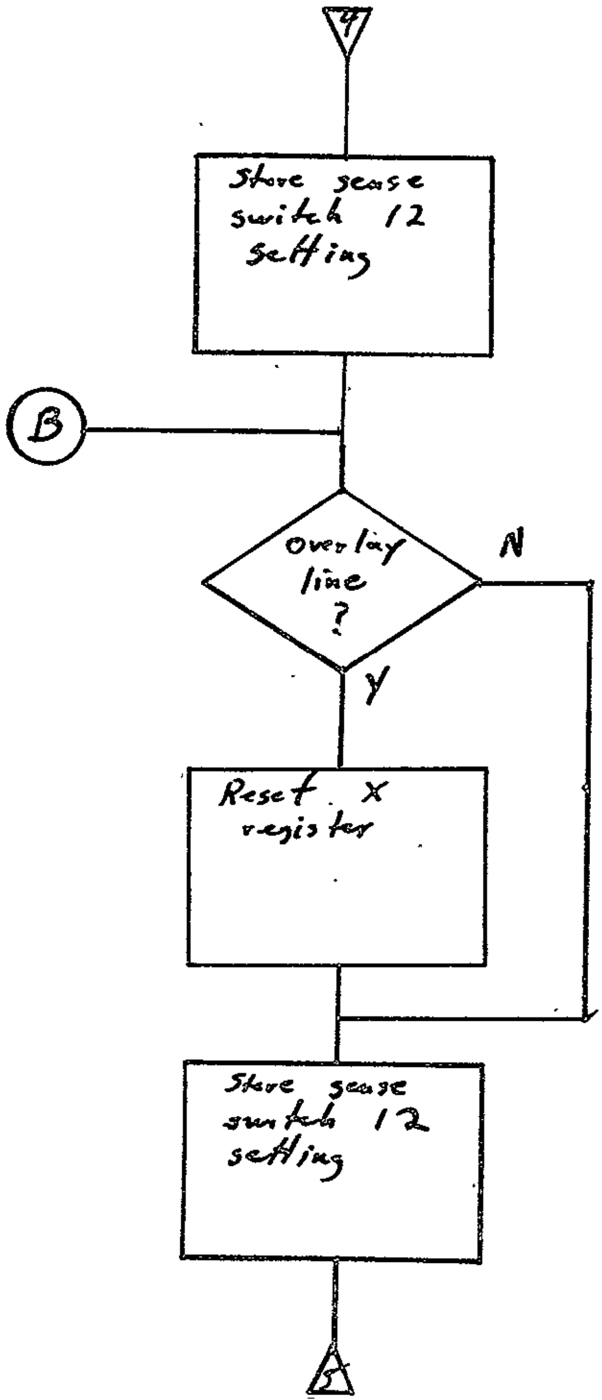

PDP
Zero FOT, CHRFCT
LINCNT, ADVI, IFLG
Set CURBUF, NEXOUT
and PBUFSB
Do FC7CLR, FRSPIC
Initialize FCCUTS
to SKP instruction,
INXSSW to NOP
instruction
MTRINI
Initialize tape
routines
JSEP
Read, decode
tape label &
place on film
1

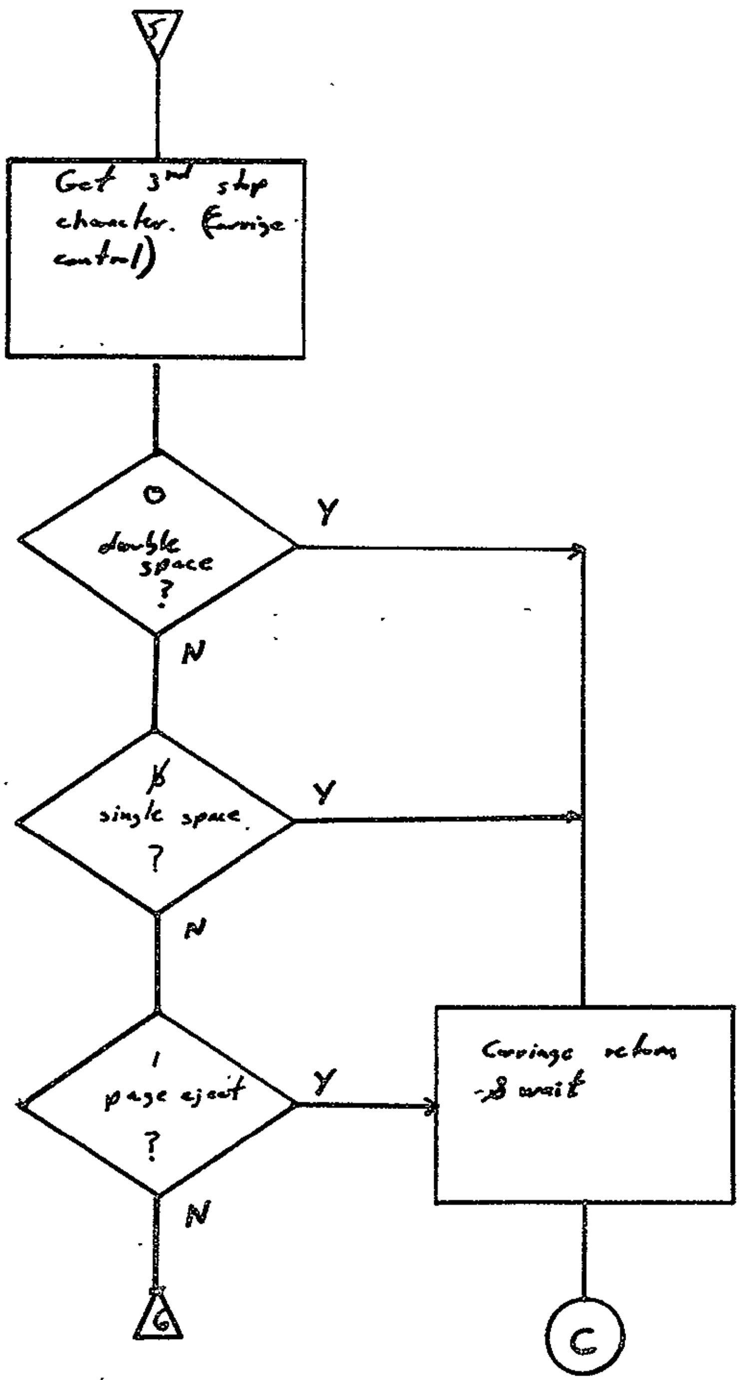

1
OUTTTY
Output tape label to teleprinter
NXTPC
Advance Frame
Place "end-of-buffer" code at end of both tape buffers
SETVCH
Set dispatch bit for carriage return end of buffer
2

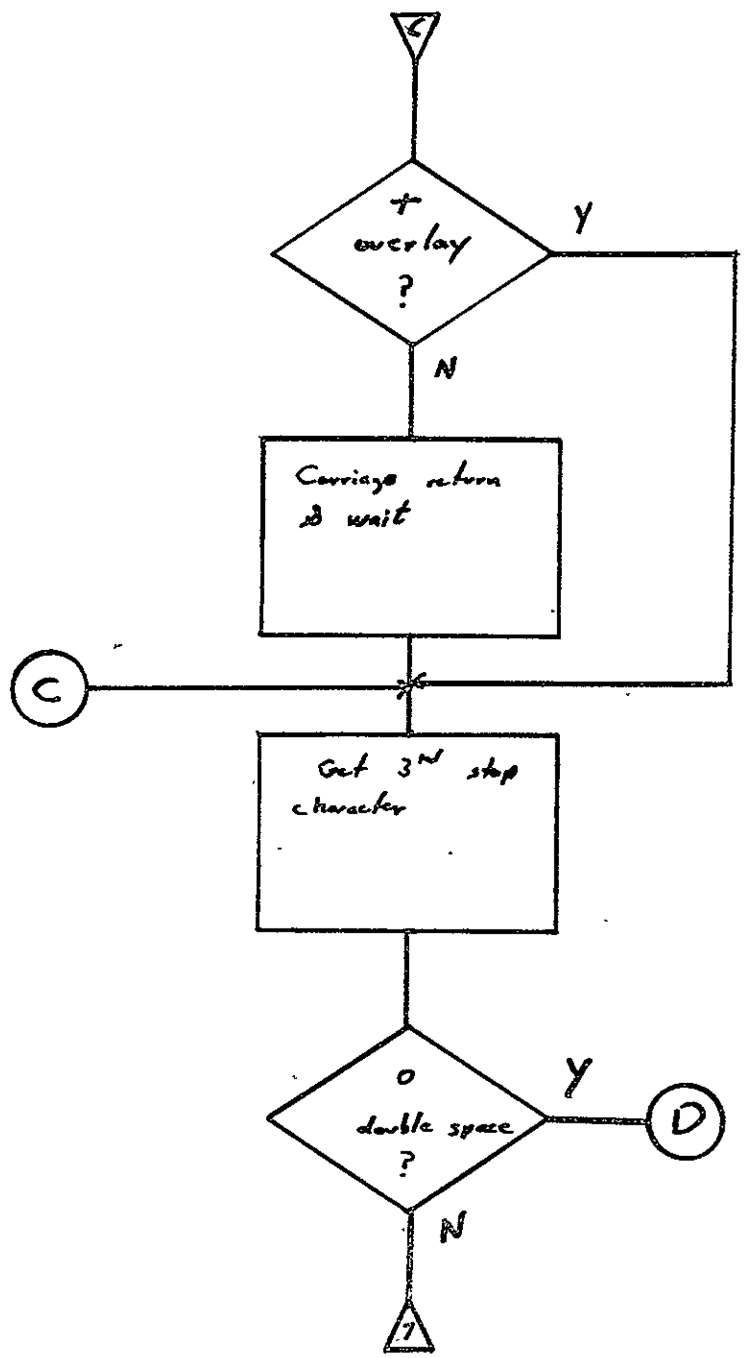


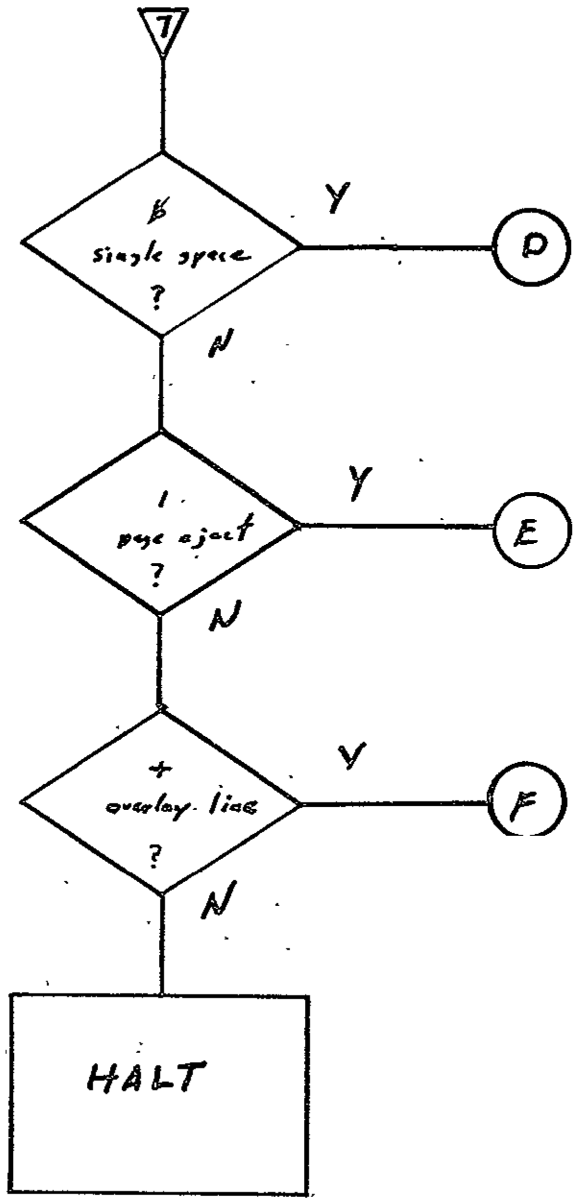
REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR

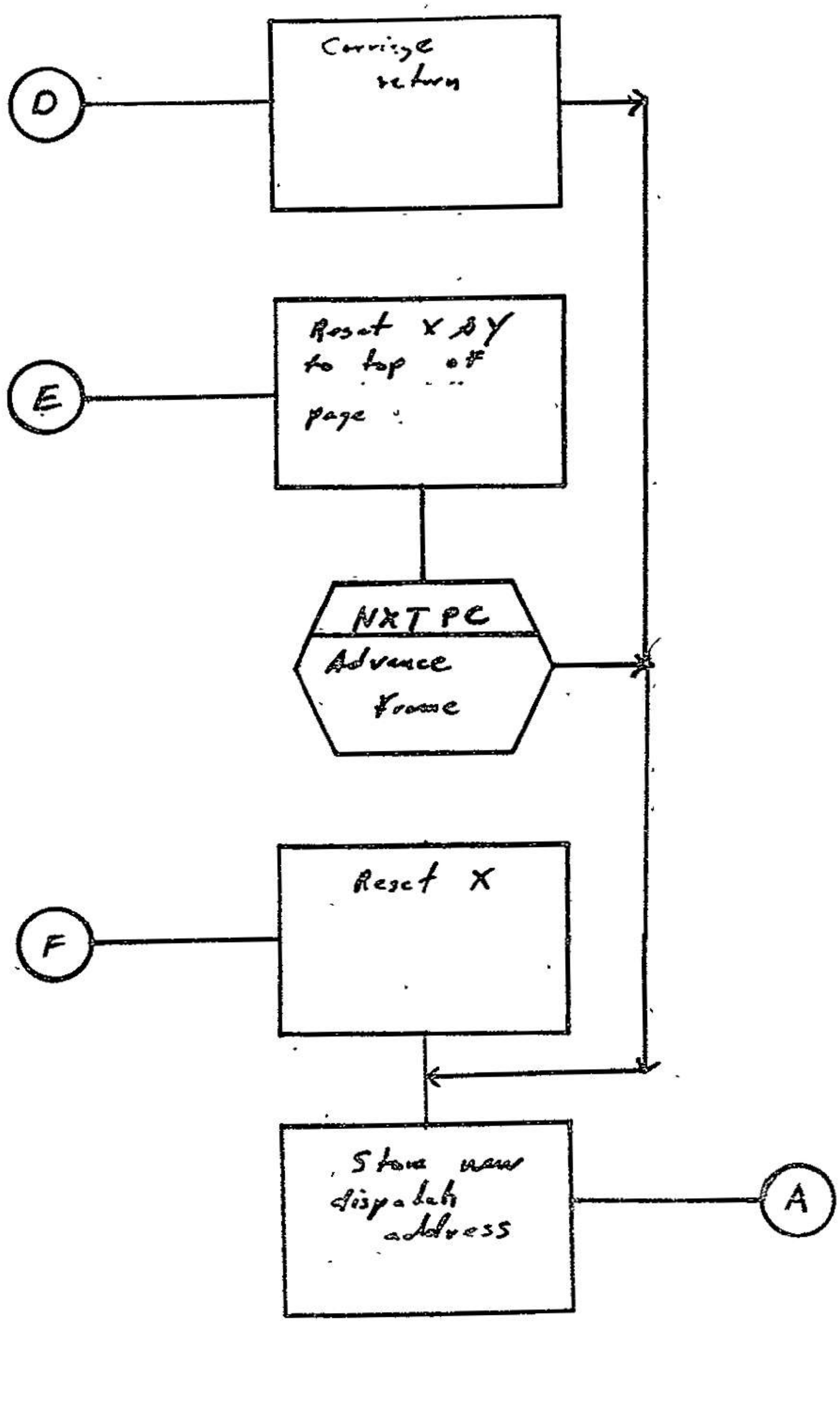

3
EXDSP
Extract 1st char from stop address
EXDSP
Extract 2nd char from stop address
EXDSP
Extract 3rd char from stop address
Sense switch 13 on ?
N
B
Y
Sense switch 12 = previous 12?
N
Reset x & y to previous values
Y
4
A

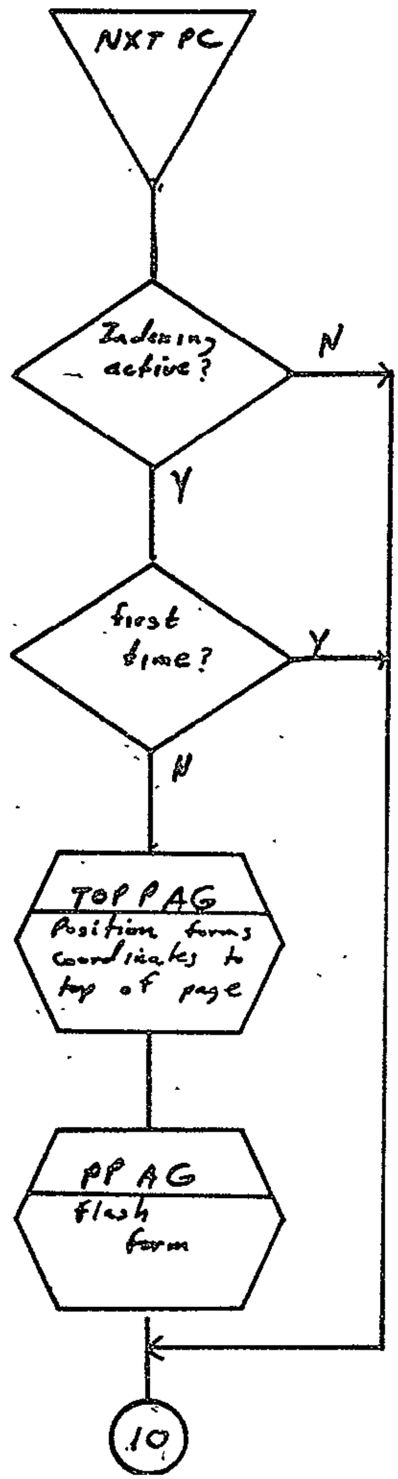

4
Store sense switch 12 setting
B
overlay line ?
N
Y
Reset X register
Store sense switch 12 setting
5

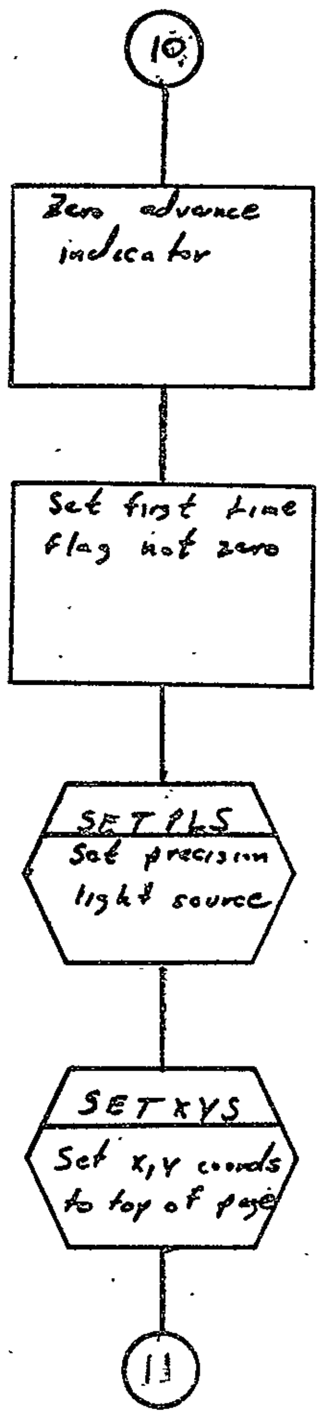

5
Get 3rd step character. (Carriage control)
0
double space
?
Y
N
b
single space
?
Y
N
1
page eject
?
Y
N
Carriage return & wait
6
C


C
+
overlay
?
Y
N
Carriage return
& wait
C
Get 3rd stop
character
0
double space
?
Y
D
N
7

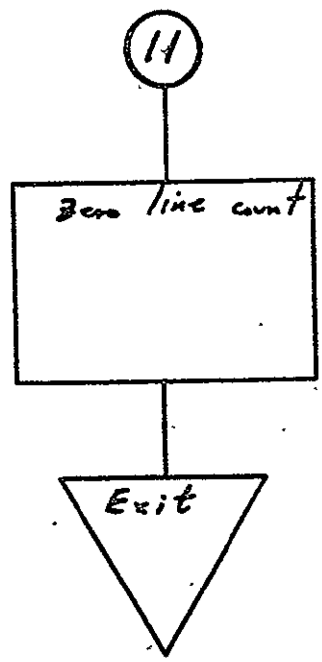

7
b̸
single space
?
Y
D
N
1
page eject
?
Y
E
N
+
overlay line
?
Y
F
N
HALT

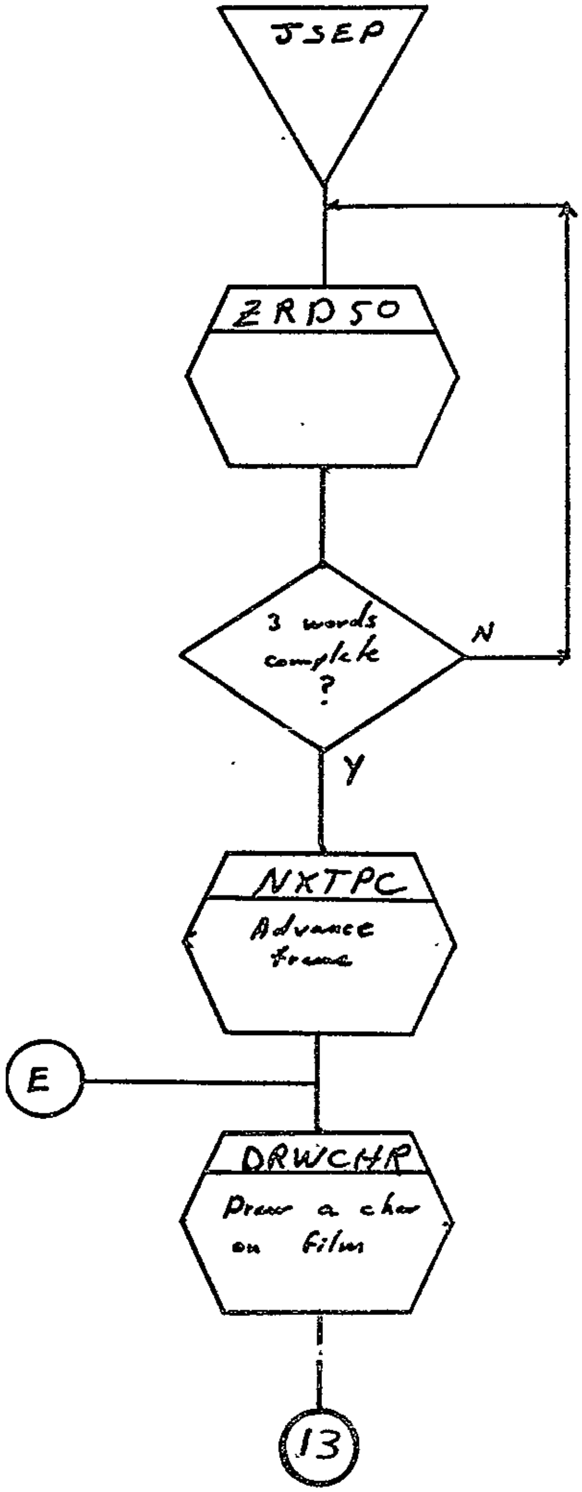

D
Carriage return
E
Reset X & Y to top of page
NXTPC
Advance frame
F
Reset X
Store new dispatch address
A

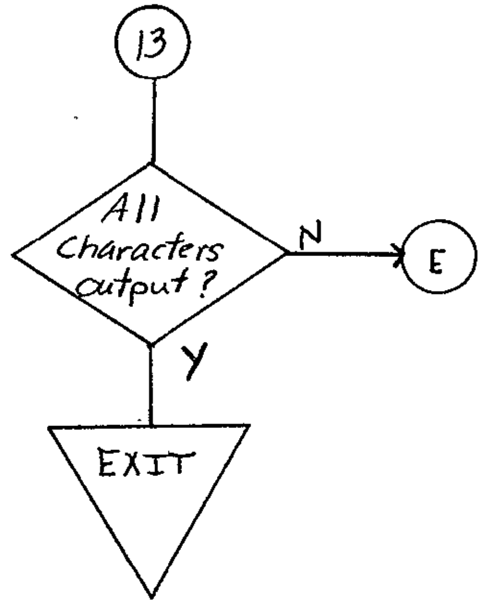

NXT PC
Indexing active?
N
Y
first time?
Y
N
TOP PAG
Position forms coordinates to top of page
PPAG
flash form
10

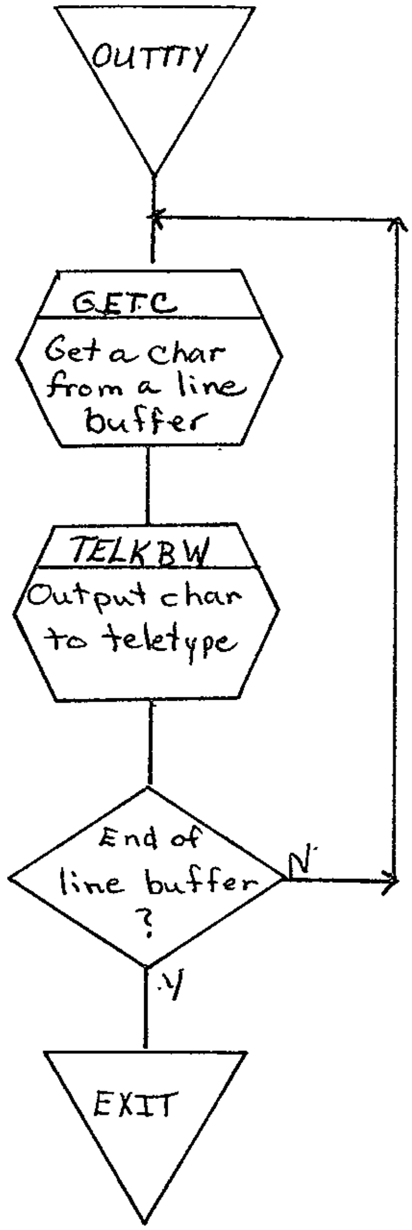


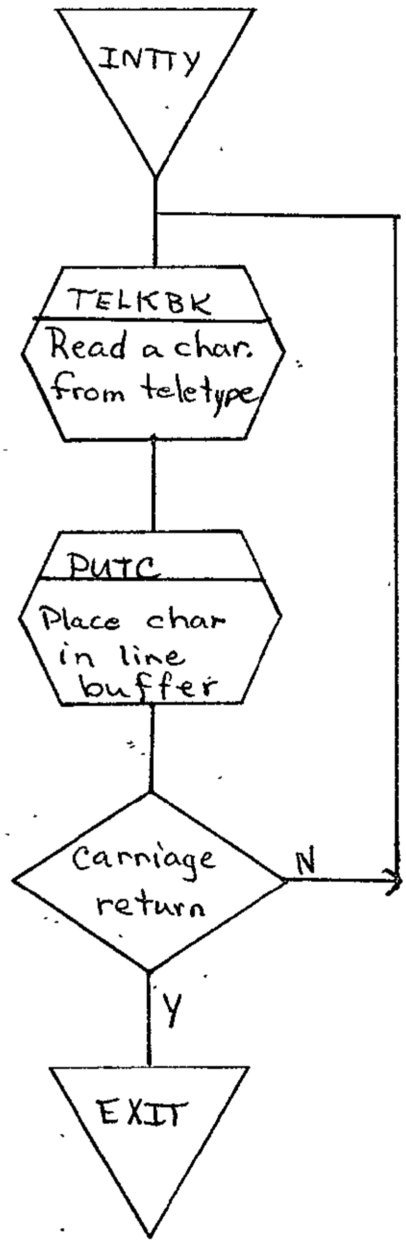
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

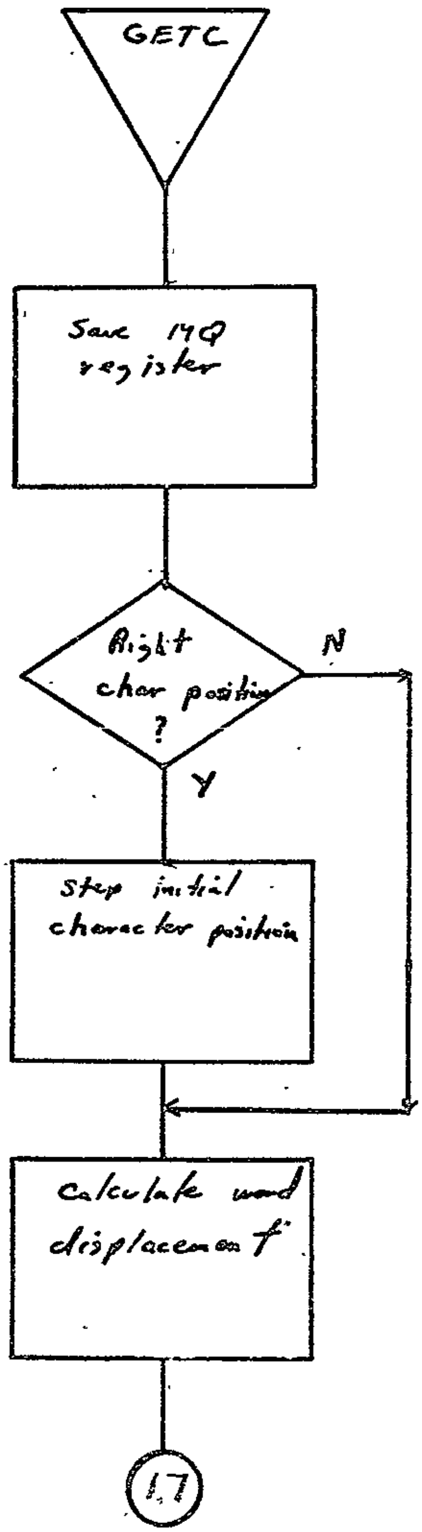

11
Zero line count
Exit

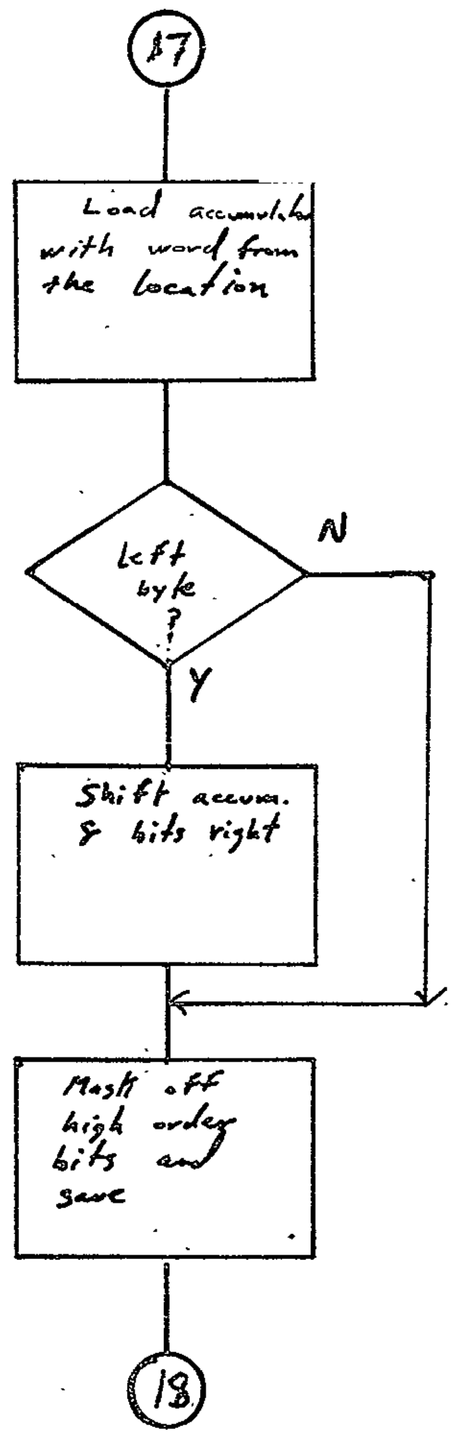

JSEP
ZRD50
3 words complete ?
N
Y
NXTPC
Advance frame
E
DRWCHR
Draw a char on film
13

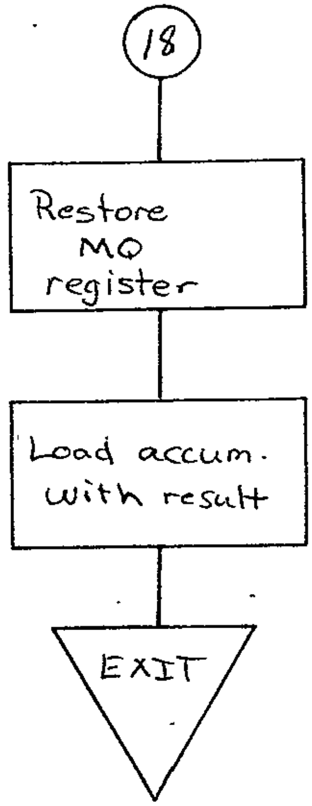

13
All Characters output?
N
E
Y
EXIT

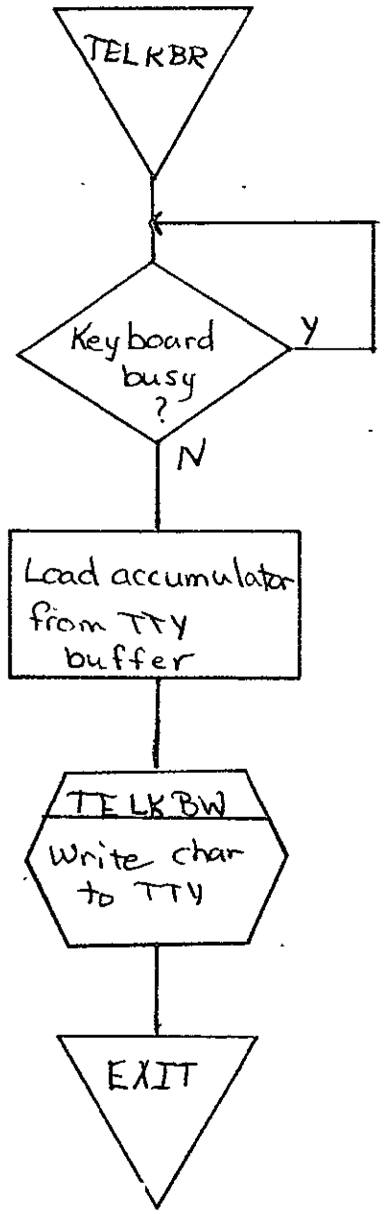

OUTTTY
GETC
Get a char from a line buffer
TELKBW
Output char to teletype
End of line buffer ?
N
Y
EXIT

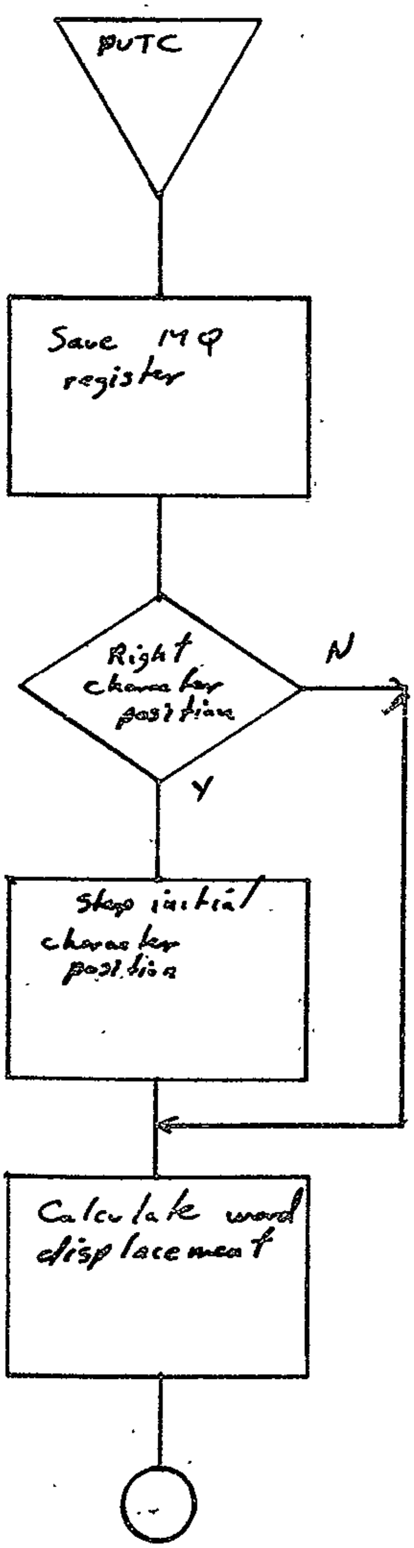

INTTY
TELKBK
Read a char. from teletype
PUTC
Place char in line buffer
Carriage return
N
Y
EXIT

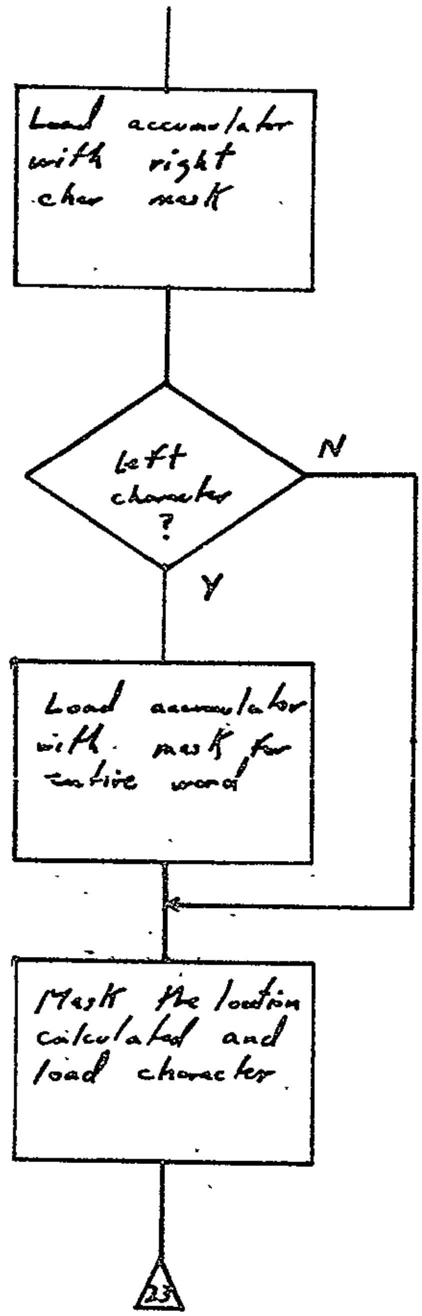

GETC
Save 14Q register
Right char position ?
N
Y
step initial character position
calculate word displacement
17

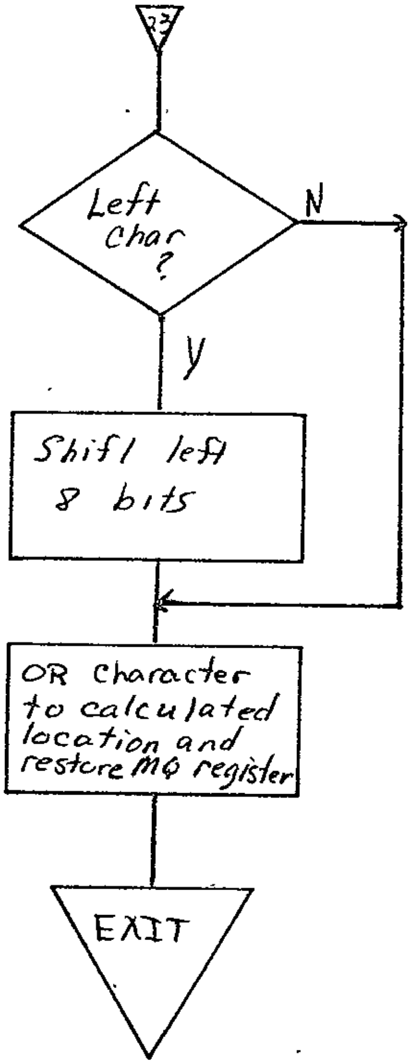

17
Load accumulator with word from the location
left byte ?
N
Y
Shift accum. 8 bits right
Mask off high order bits and save
18

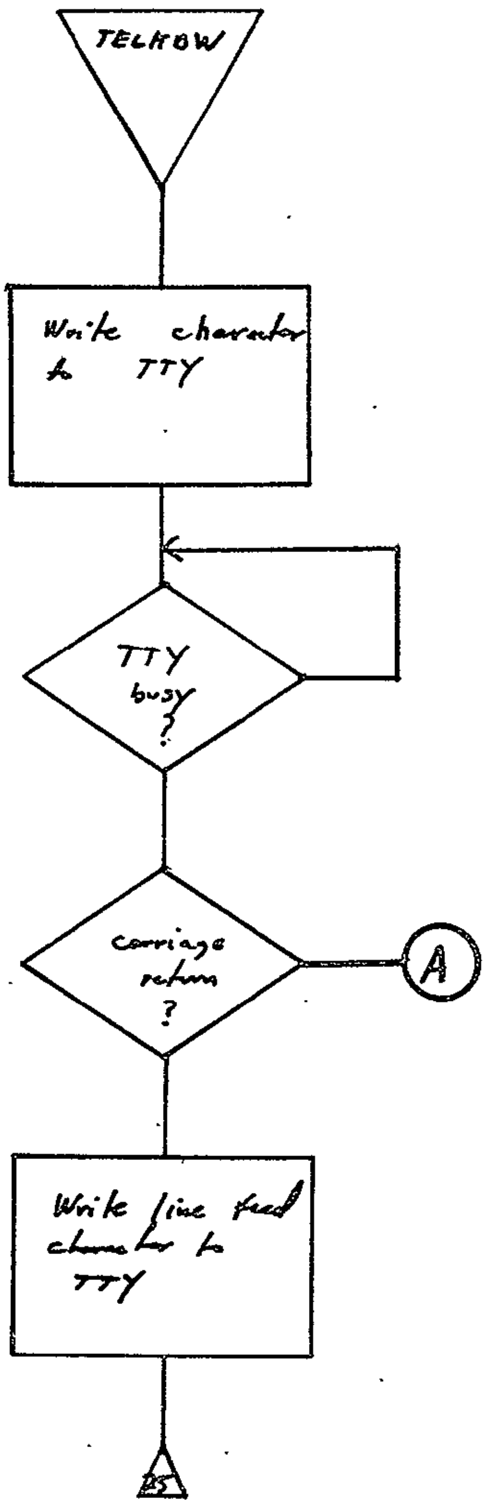

18
Restore MQ register
Load accum. with result
EXIT

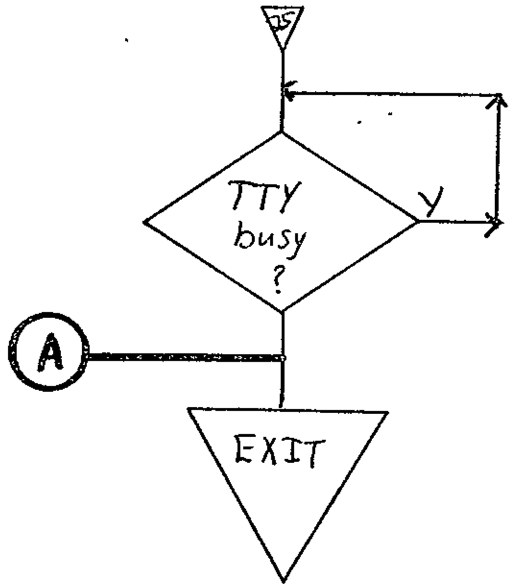

TELKBR
Keyboard busy ?
Y
N
Load accumulator from TTY buffer
TELKBW
Write char to TTY
EXIT

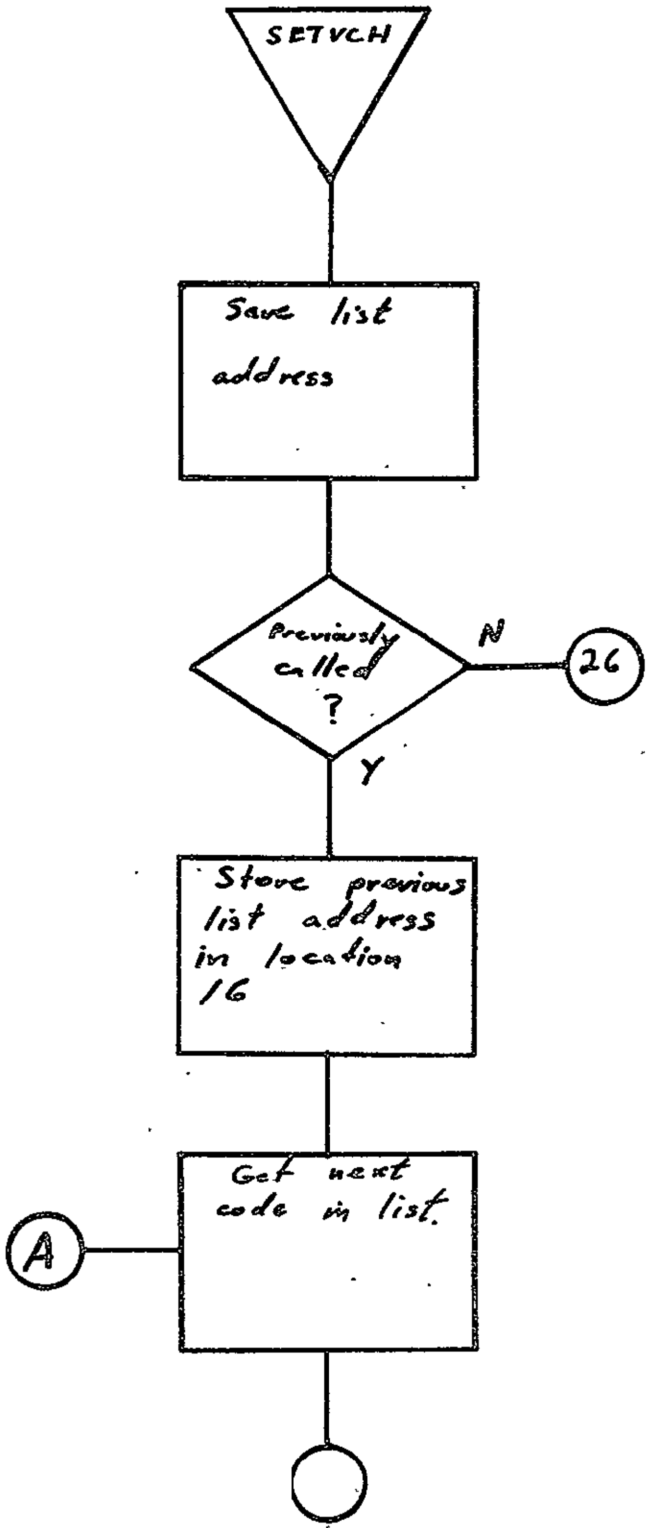

PUTC
Save MQ register
Right character position
N
Y
Step initial character position
Calculate word displacement

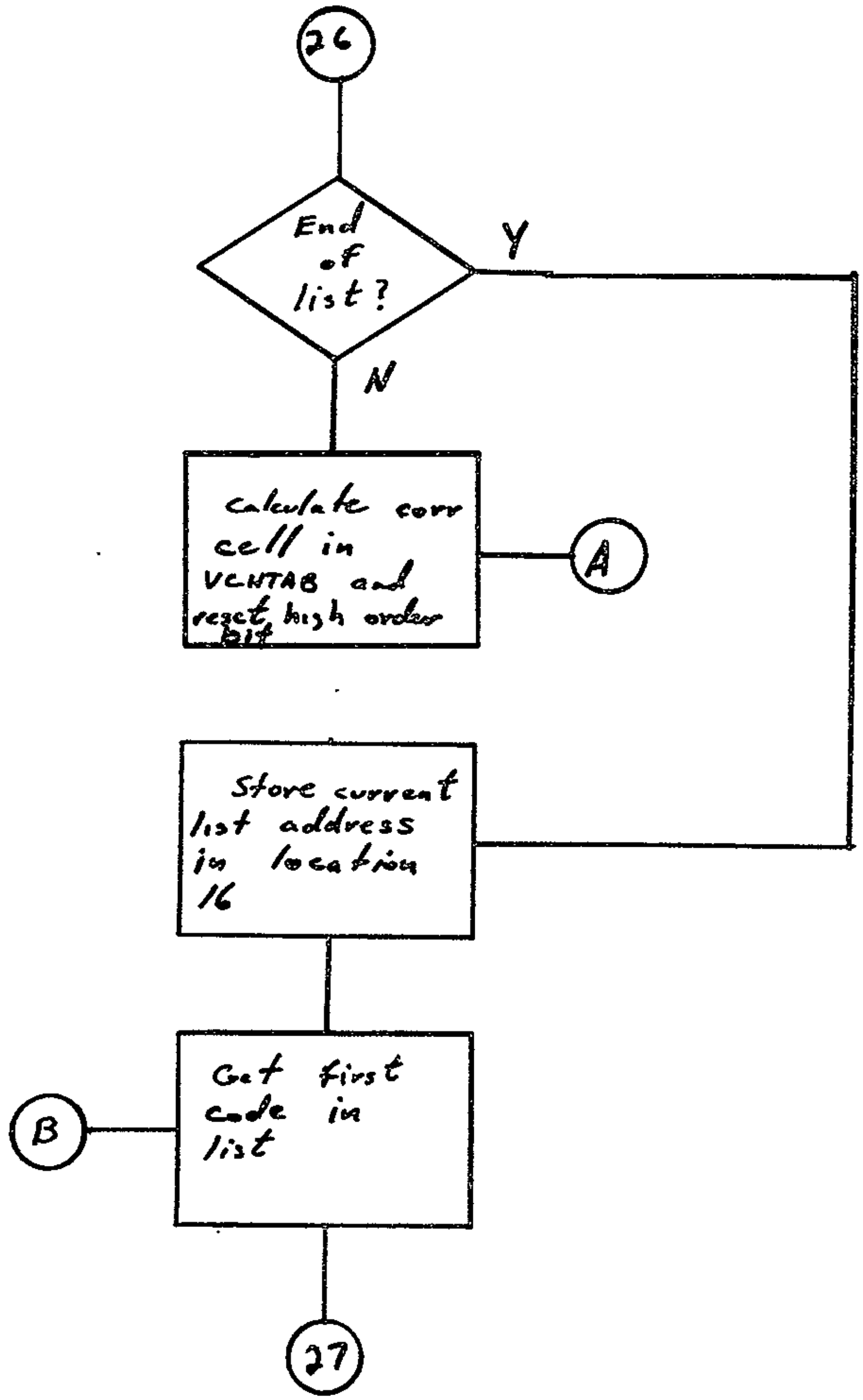

Load accumulator with right char mask
left character ?
N
Y
Load accumulator with mask for entire word
Mask the location calculated and load character
23

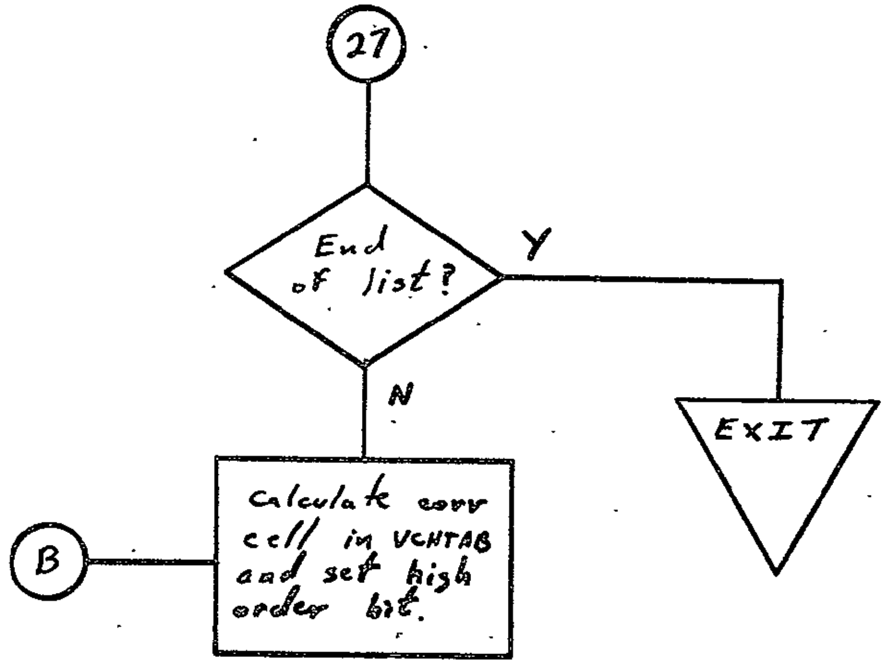

Left Char ?
N
Y
Shift left 8 bits
OR character to calculated location and restore MQ register
EXIT

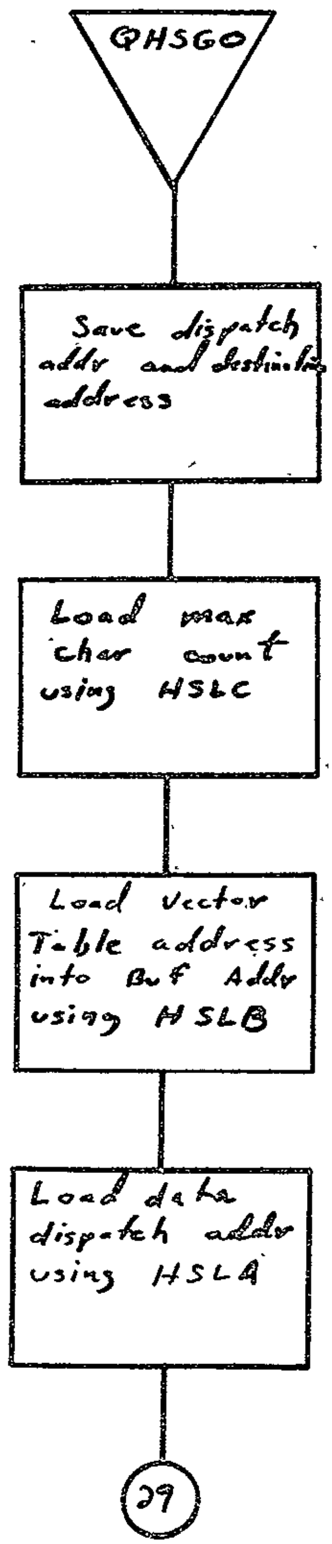

TELKOW
Write character to TTY
TTY busy ?
carriage return ?
A
Write line feed character to TTY
25

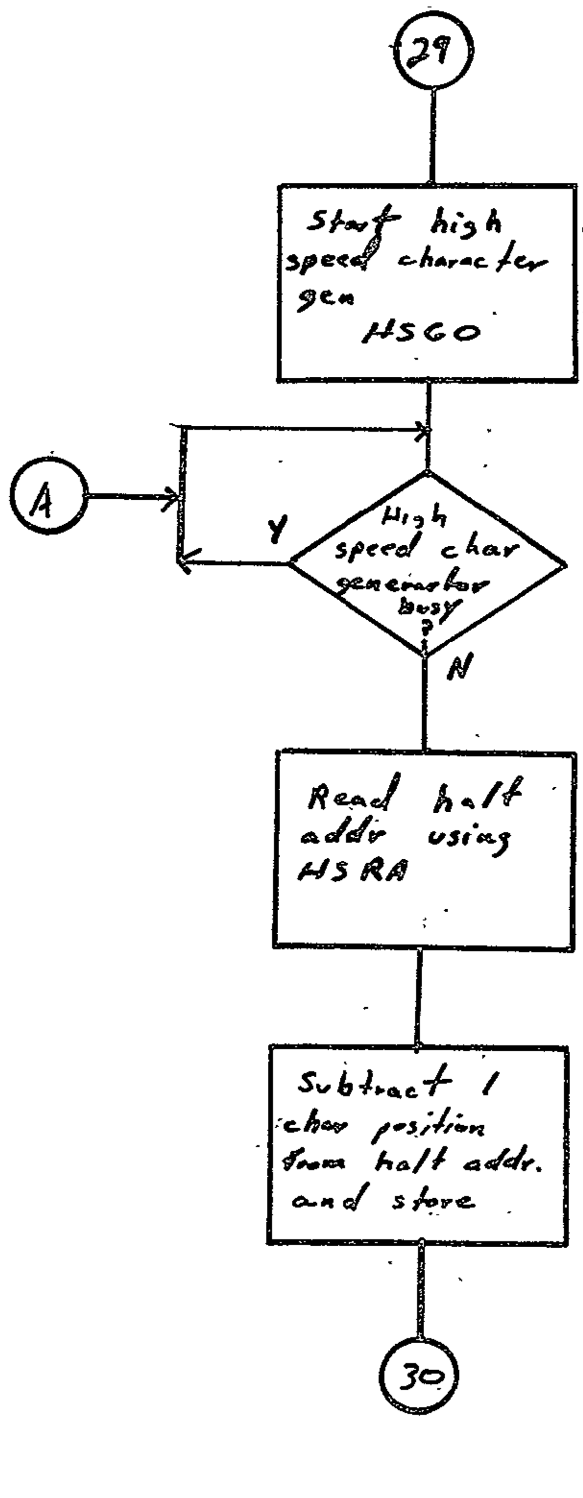

TTY
busy
?
Y
A
EXIT

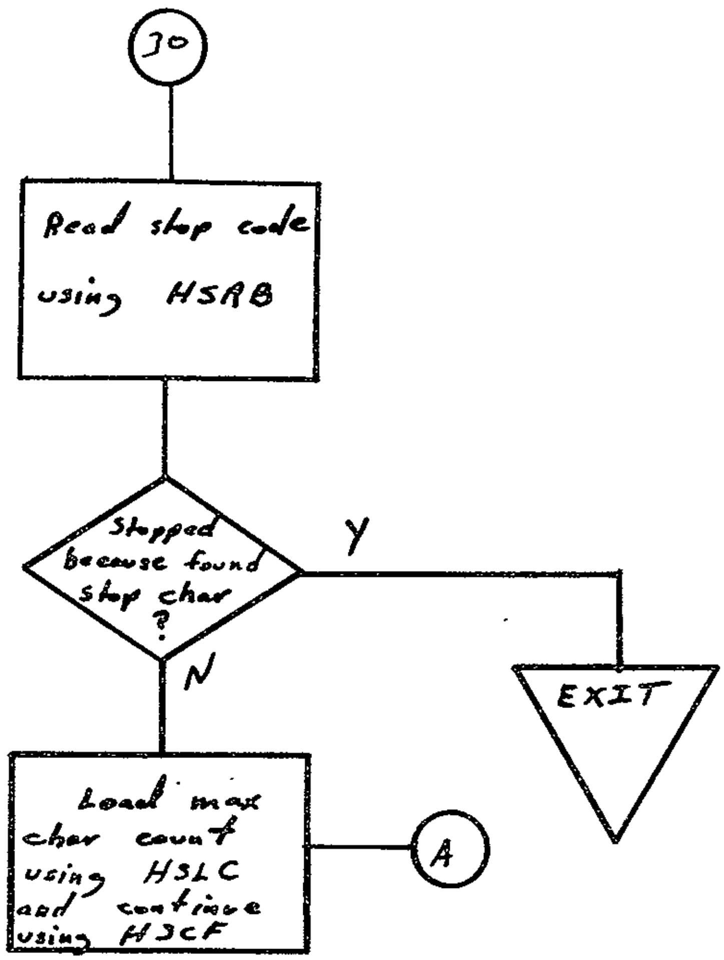

SETVCH
Save list address
Previously called ?
N
26
Y
Store previous list address in location 16
Get next code in list.
A

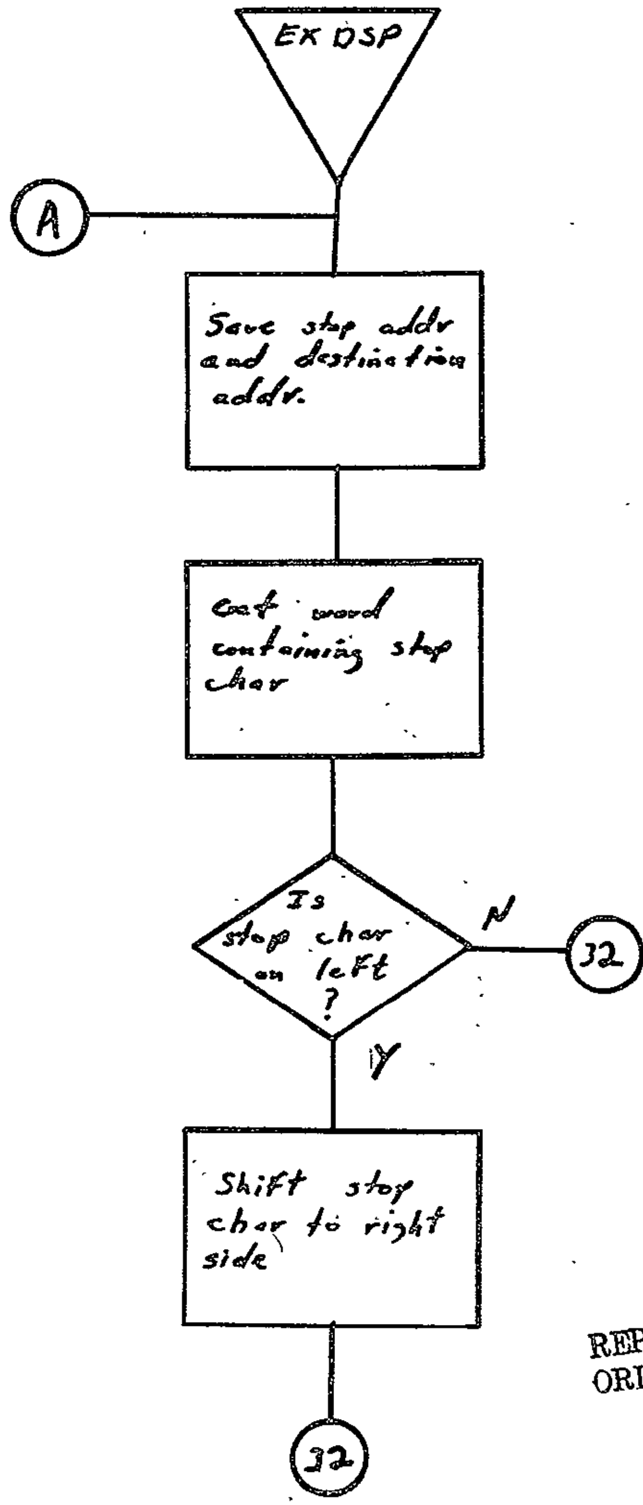

26
End of list?
Y
N
calculate corr cell in VCHTAB and reset high order bit
A
Store current list address in location 16
Get first code in list
B
27

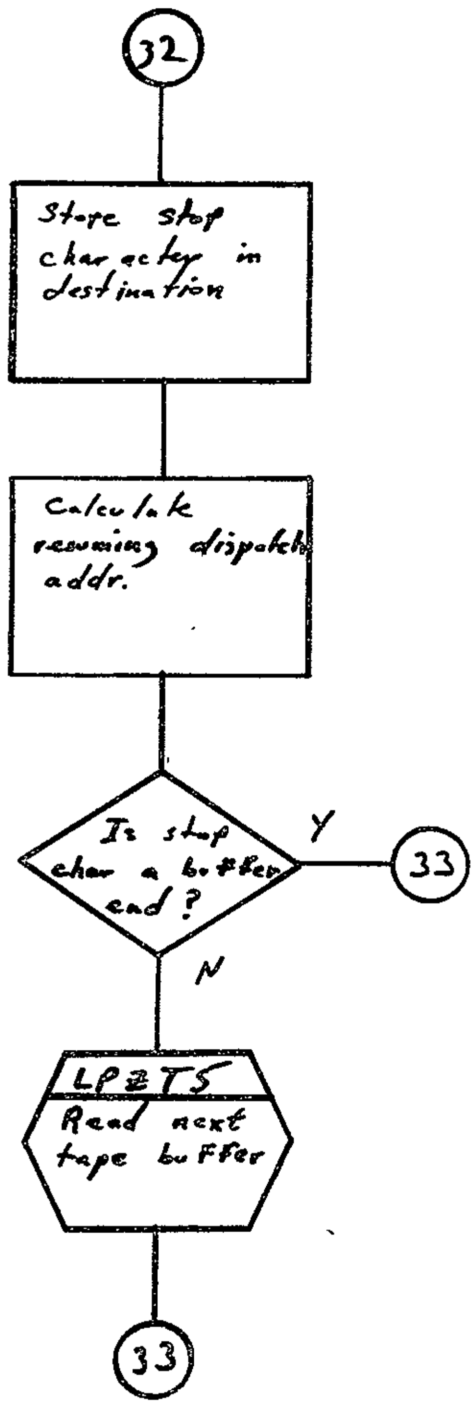

27
End of list?
Y
N
EXIT
B
Calculate corr cell in VCHTAB and set high order bit.

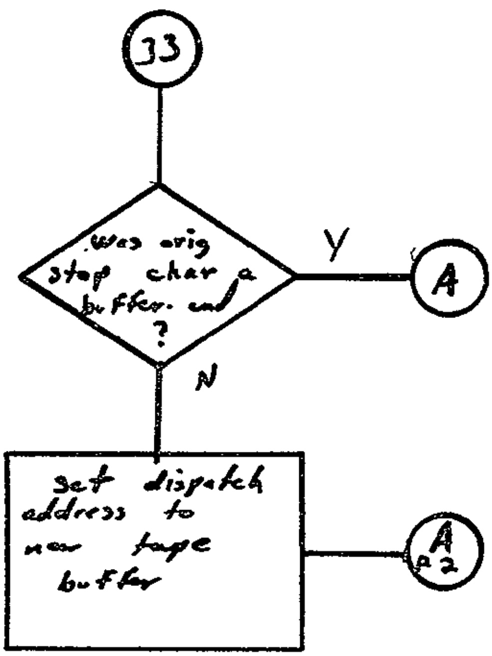

QHSGO
Save dispatch addr and destination address
Load max char count using HSLC
Load Vector Table address into Buf Addr using HSLB
Load data dispatch addr using HSLA
29


29
Start high speed character gen HSGO
A
Y
High speed char generator busy ?
N
Read halt addr using HSRA
Subtract 1 char position from halt addr. and store
30


30
Read stop code using HSAB
Stopped because found stop char ?
Y
N
EXIT
Load max char count using HSLC and continue using HSCF
A


EX DSP
A
Save stop addr and destination addr.
Get word containing stop char
Is stop char on left ?
N
32
Y
Shift stop char to right side
32


32
Store stop character in destination
Calculate resuming dispatch addr.
Is stop char a buffer end?
Y
33
N
LPZTS
Read next tape buffer
33


33
Was orig stop char a buffer end ?
Y
A
N
set dispatch address to new tape buffer
A
P2

2.7 COMA PDP 11/45 PRINT PROCESSOR FOR 105 mm FICHE (PDP105)

2.7.1 Background

A. Author. V. Pote, Aeronutronic Ford Corp.

B. Intent. The requirements for these programs are specified in SISO-generated document SH-25073. PDP15 is requested when a PDP 11/45 FORTRAN generated print tape has been submitted for data to be output to 105 mm fiche.

C. Program History

1. Production Tape Date. 17 September 1973

2. Author. V. Pote

3. Authorization. EO-165F

4. Test Cases. Test tape specification SH-25713

5. Revisions. Reference Appendix B, paragraph B.7.

2.7.2 Introduction

2.7.2.1 Hardware Requirements

- FR80 with 12K memory
- 9-track tape unit
- 105 mm unsprocketed camera.

2.7.2.2 Software Requirements. The following files, found in I.I.I.'s SYM Directory, are required:

III109	III186	III147	III161 GO
III166	III164	III162	III166
III185	III163	III161	III187

2.7.2.3 Assembly Parameters

A. 9-TRACK. If 1, indicates data will be coming from a 9-track tape drive.

B. MUMBLE. If 1, defines system configuration for output to the teletype.

C. FONT. If 0, indicates standard I.I.I. character font III164.

D. LOCASE. If 1, defines lower case characters in the character set.

E. IIISET. If 1, assembles a dispatch tube for I.I.I. standard character codes.

F. TWOBUF. If 1, defines two magnetic tape buffers for higher throughput.

G. BIGBUF. If 1, defines minimum amount of features with maximum buffer space.

H. MTSIZE. Magnetic tape buffer size (= 1001).

I. MTTSIZ. Teletype buffer size (= 210).

J. FTYPE. Camera indicator (= 105 mm).

K. MANYUP. If 1, defines code for multiple images per frame for 105 mm microfiche.

L. NOPISP. If 1, indicates that monitor is not to be displaye

M. CAMNUM. If 9, indicates that 105 mm unsprocketed camera is to be used.

N. ALLOW. If 600, allows forms flash.

O. FINDEX. If 1, allows Fiche indexing.

2.7.2.4 Operator Commands. The following commands shall be used for the PDP105 execution.

PDP105$J

*MONITOR (Returned by FR80)
GO/)
ENTER TAPE NBR (Operator enters tape No. after this msg.)
ENTER COM CONTROL (Operator enters COM CONTROL) . If only a) is typed, processing continues)
END JOB/) (When EOF has been returned)

2.7.3 Analysis

2.7.3.1 Major Control Section

A. Description. The mainline code for this processor begins at BEGIN. The program first initializes all storage used by the program in order to make the program reusable. All flags and instruction switches are set to their initial values. Next, FRSPIC is called to initialize the camera, and CURBUF, NEXBUF and PBUFSZ are initialized to current buffer address, alternate buffer address, and buffer size, respectively. The control is passed to the III routine MTRINI to initialize the tape handler. Upon return, control is passed to the internal subroutine JSEP to interpret the tape label and place it on film as the job separator. JSEP first utilizes the internal subroutine ZRD50 to convert each of the first three words in the 14-byte header from RAD50 format to teletype ASCII. Next, JSEP goes to internal subroutine NXTPC which effects a NEXPIC and advances the film one frame.

After the job separator has been processed, the main loop of the program is entered at GETCH to read one character at a time, using the GETT macro. If the character read is not a control character, the program stores it in the line buffer which is the buffer used by the high-speed character generator to output a line to film. Control is then returned to GETCH to read the next character. However, if the character is a control character, actions depend on the character. If it is a carriage return character, and if the previous character is a line feed, the internal subroutine FLMOUT is called to output the contents of the line buffer to film utilizing the high-speed character generator. If the initial character is a line feed, control is transferred to GETCH.

The first character in each line is interpreted as a FORTRAN carriage control character. If it is a +, control is returned to GETCH, indicating that the current line buffer will be partially overlayed with a new line before placing film. If it is not a + and the previous character was a line feed, the internal subroutine FLMOUT is called to output the line buffer to film. If the carriage control character is a 1, the indicator ADV1 is set to indicate to FLMOUT to advance a frame after output. If the carriage control character is a 0, then (upon return from FLMOUT) the program will execute a CRT, PSTLL combination to effect double spacing. Control is then returned to GETCH to read the next character.

FLMOUT is the internal subroutine which places the contents of the current line buffer on film. The first time FLMOUT is entered, a NEXPIC is executed to advance the film. The subroutine, ASCIIV, is called which utilizes the machine-level high-speed character generator to output the line to film. Upon return, a CRT, PSTLL combination is executed to position to the next line on film. The line count is incremented and if the number of lines exceeds 67, or if the advance indicator ADVI is present, the film is advanced to the next frame and the line counter is reset.

Each time FLMOUT needs to advance to the next frame, the internal subroutine NXTPC is called. In addition to advancing the film, this subroutine ensures that the required form is flashed if it was requested. The DAC register coordinates are also set by this subroutine after the advance for both the forms coordinates and the text coordinates.

B. Input/Output

1. Input. Data shall be input from a 9-track tape drive in variable length lines with a physical record size of 512 bytes. The tape will contain a 14-byte header record containing in the first three words the table label in RAD50 format.

2. Output. Output of data is to 105 mm film. Page size is 64 lines maximum; line length is 132 lines maximum.

3. Error Message Output. ILLEGAL FORM is output when a form number greater than four has been requested.

C. Linkages

1. External

Routine	Program	Routine	Progra
MTRIWI	III163	DRWVEC	III162
NEXPIC	III166	SETXYS	III166
SETPLS	III166	SETHPS	III162
KYBLIS	III166	SETTLS	III162
FRSPIC	III166	MTBYTE	III163
DRWCHR	III162	MCRLF	III166
GETT	III163	MMFSSG	III166

2. Internal Routines

FLMOUT	JSEP	GETC	TELKVW	QHSGO	JSEP2
NXTPC	CUTMAK	PUTC	OUTTY	EXDSP	PLCE
PLSET	ZRD50	TELKBR	INTTY	SETUCH	

2.7.3.2 Subroutines

A. FLMOUT. Outputs the contents of the line buffer onto a line of microfilm using the high-speed character generator.

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When FLMOUT is called, LNBUF should contain up to 132 characters of data and CHRFCT should contain the number of characters to output. If IFLG is zero, initialization is assumed and a frame advance will be done.

B. NXTPC. There are no parameters passed to NXTPC. NXTPC will advance the film to a new frame and reset the X and Y coordinates for both forms and text to the top of the page. Before the advance if forms were requested, NXTPC will call PPAGE to flash the form.

C. PLSET. Sets the delta X and Y, the intensity, and the spot size, and calls SETPLS to initialize the DAC registers.

D. ASCIIV. Using the high-speed character generator, the character count is loaded with the complement of the AC, the Character Table address is loaded with VCHTAB reflecting the desired film font, and the initial byte address is loaded with the address of the line buffer. Then a HSGO command is given to output the line to film.

E. JSEP. Reads the header label from the tape, decodes it from RAD50 format to ASCII, advances the film, and if 16 mm film is being used, draws the nine ASCII characters on the film in eyeball-sized letters.

F. CUTMAK. Outputs cut marks.

G. ZRD50. Converts the contents of the AC from RAD50 to three seven-bit ASCII characters.

H. GETC. Obtains a character from a specified line buffer in a specified position and places the character in the AC. The cell L132AD should be loaded with the address of the line buffer and CHPOS should be loaded with the character position upon entry.

I. PUTC. Places the character contained in the AC into a specified line buffer at a specified character position. L132AD should contain the line buffer address and CHPOS should contain the character position.

J. TELKBR. Reads a character from the teletype and places it in the AC.

K. TELKBW. Writes the character contained in the AC to the teletype.

L. OUTTTY. Outputs a line to the teleprinter. The line buffer address should be loaded into the AC before entry, and the line buffer should be formatted in standard 9-track buffer format. The octal code 377_8 denotes the end of the buffer.

M. INTTY. Inputs a line from the teletype. Upon entry, the AC should contain the line buffer address. The line buffer will be formatted in standard 9-track buffer format. A carriage return will terminate the input.

N. TTYCRC. Reads COM control information from teletype.

O. FRMREC. Initializes forms parameters (YINDX, XINDX, and CHRNS).

2.7.3.3 Constants and Variables

A. Internal

1. ADVI. When set, instructs subroutine FLMOUT to advance film.

2. ALPHX. Initial X DAC register text.

3. ALPHY. Initial Y DAC register text.

4. CHPOS. Contains the character position of the line buffer.

5. CHRCNT. Location containing the number of characters that are to be used in the index frame.

6. CLDELX. Text of delta X in scope points.

7. CLDELY. Text of delta Y in scope points.

8. CLRSIZ. Text of character size.

9. CURBUF. Word containing the address of the buffer currently being used.

10. ERFLAG. A flag that, when set to zero, indicates that the Error Form Flag is to be checked.

11. ERFMFL. Error Form Flag.

12. FLASSW. A flag in the program used to determine if a form is to be flashed.

13. FOLFTX. A location containing the beginning raster point (X coordinate) for a form.

14. FOTOPY. A location containing the beginning raster point (Y coordinate) for a form.

15. FRMINP. Contains address of first form.

16. FRMPTR. Address of form to be flashed.

17. FRMTAB. Six-word table with each word giving the beginning address of a form.

18. IFLG. First-time flag for subroutine FLMOUT.

19. LEFTXX. Location containing the beginning X coordinate for a line of print.

20. L132AD. Contains the address of the line buffer.

21. LINCNT. Word containing the number of lines that have been output.

22. LNBUF. Principal line buffer used in formatting text data.

23. NEWTOP. Location containing the Y coordinate of the line to be output.

24. NEXBUF. Word containing the address of the next buffer to be used.

25. REM. Location containing the remainder which indicates which byte of the word is to be used.

26. SAVIRM. Temporary locations.

27. SPCNUM. Location containing the raster size for the X coordinate.

28. STOCSW. Flag used to initialize the indexing routine.

29. TEMP. Temporary reserved location used as a scratch work area.

30. TOPYY. Location containing the beginning raster point (Y coordinate) for all.

31. VCHAR. Location used to store digits temporarily until all numbers have been processed.

32. XINDX. Word containing the character number on which the indexing is to start.

33. YINDX. Location containing the line number that is to be used in the index frame.

B. External

1. CHDELX. Word used to set the delta X.

2. CHDELY. Word used to set the delta Y.

3. CHRNS. Number of characters in the index.

4. CHRSIZ. Contains the character size.

5. <u>FRMNUM</u>. Word containing the form number currently being used.

6. <u>IFLASW</u>. Flag used to determine if the index form is to be flashed.

7. <u>INXSSW</u>. Flag used to determine if indexing has been requested.

8. <u>MAXTRW</u>. When zero, indicates the T record has not yet been processed.

9. <u>MTCNT</u>. Word containing the number of words yet to be processed from one buffer (negative).

10. <u>MTPTR</u>. Word containing the address of the word in the buffer to be processed next.

11. <u>PBUFSZ</u>. Word containing the length of the tape buffers.

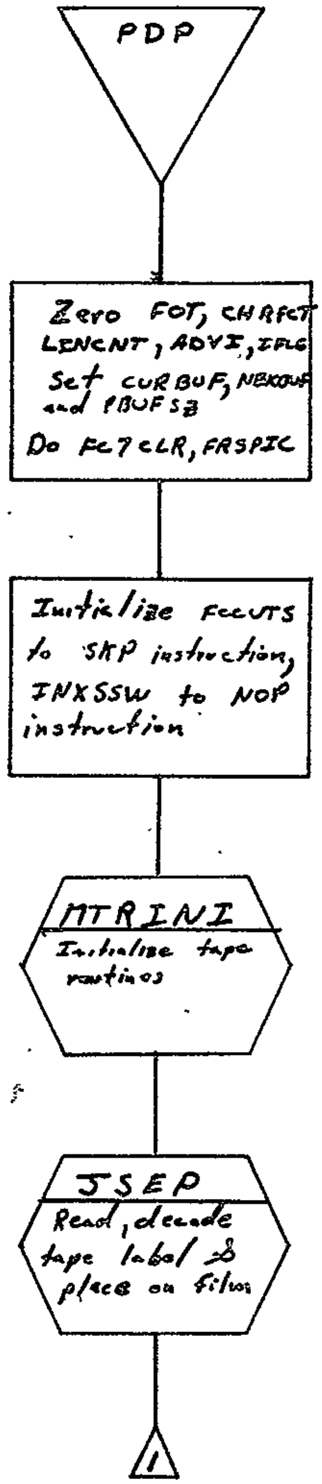
12. <u>RECPIN</u>. Contains the intensity to be used.

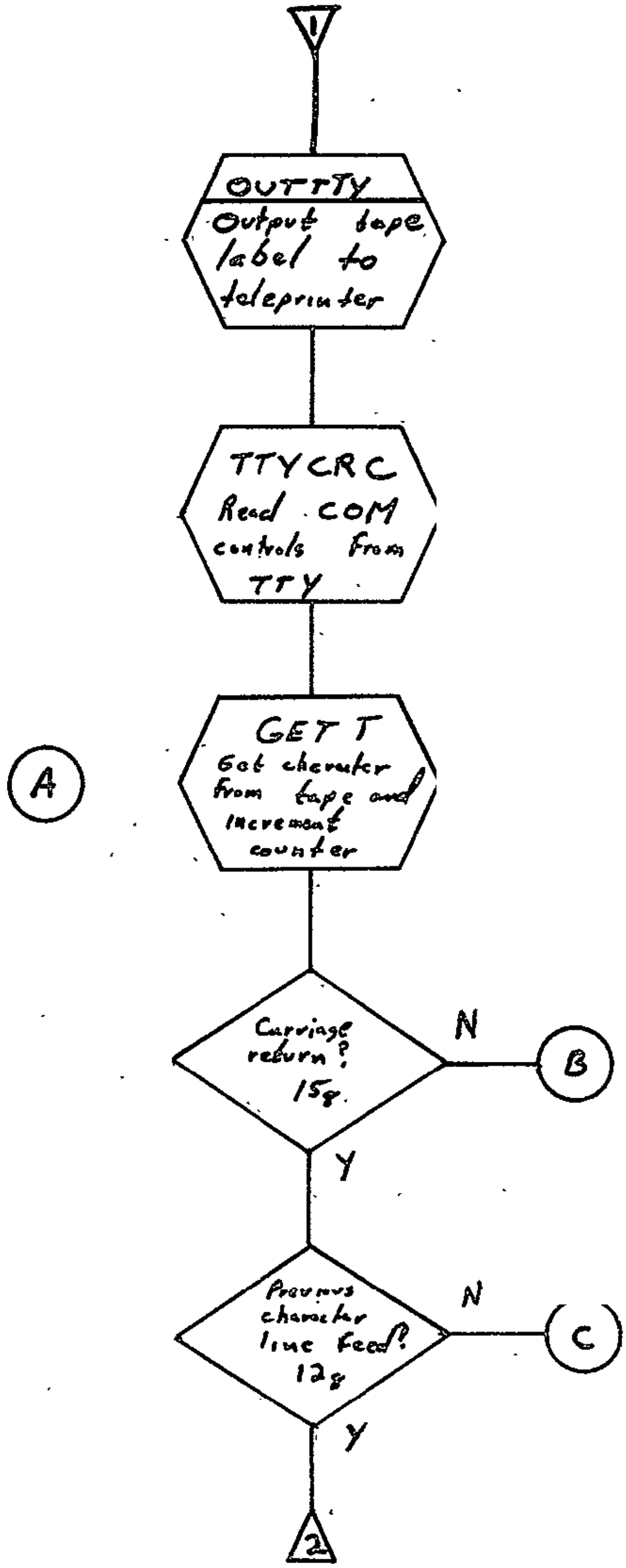
13. <u>RECSPT</u>. Contains the spot size.

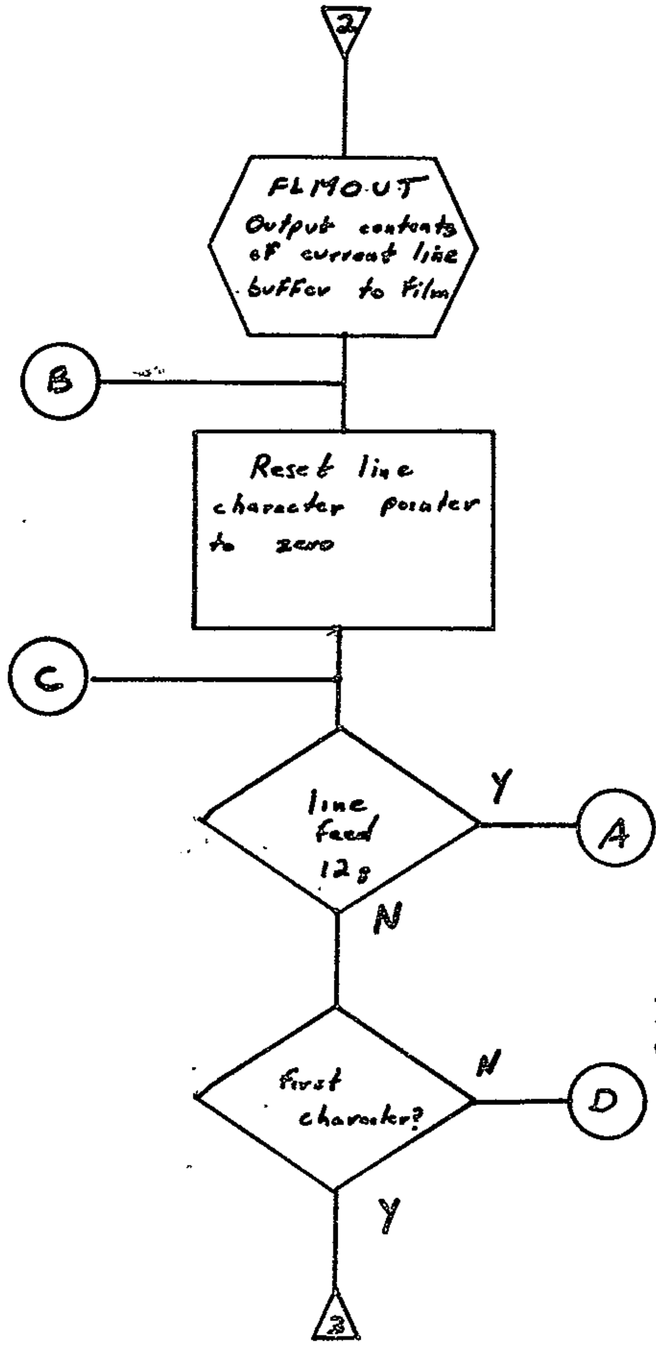
14. <u>XINDX</u>. X index value for indexing.

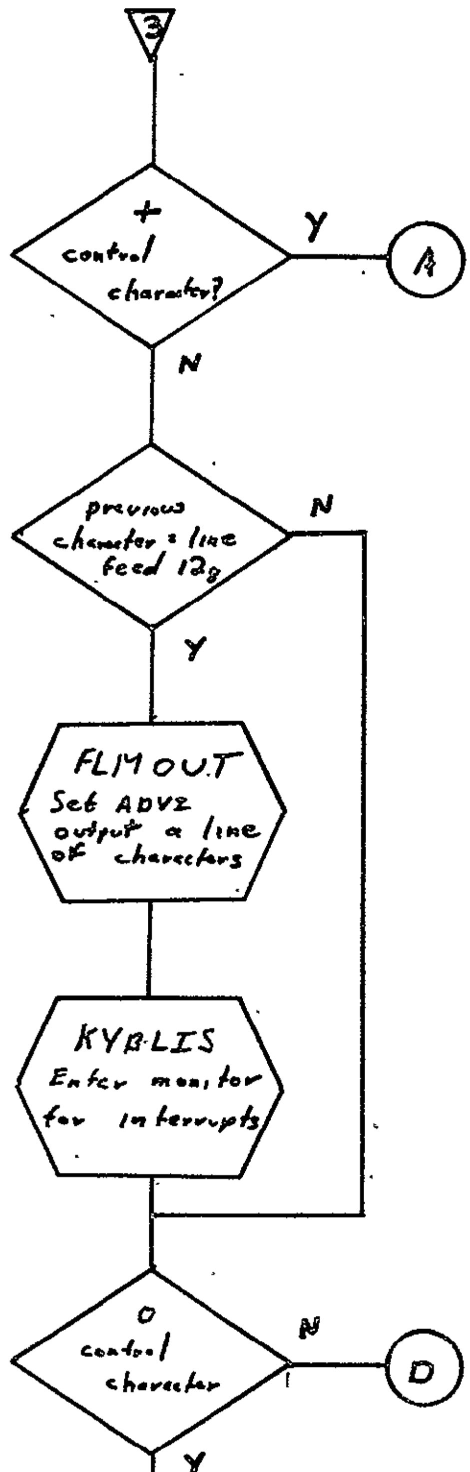
15. <u>YINDX</u>. Y index value for indexing.

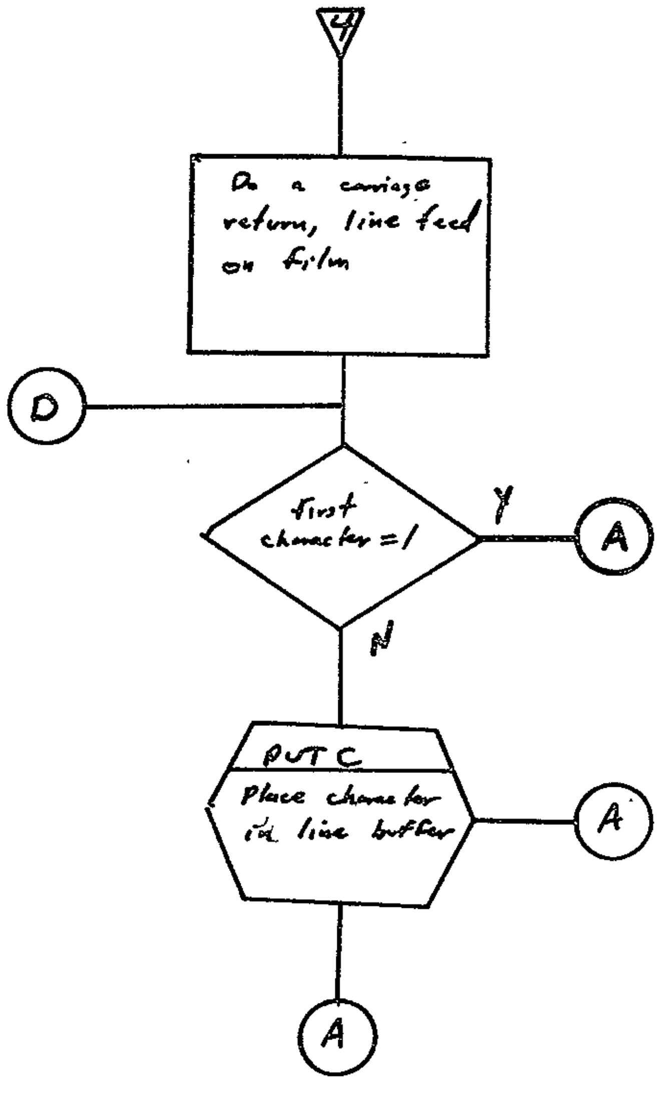
2.7.3.4 <u>Flow Charts</u>. See following pages.

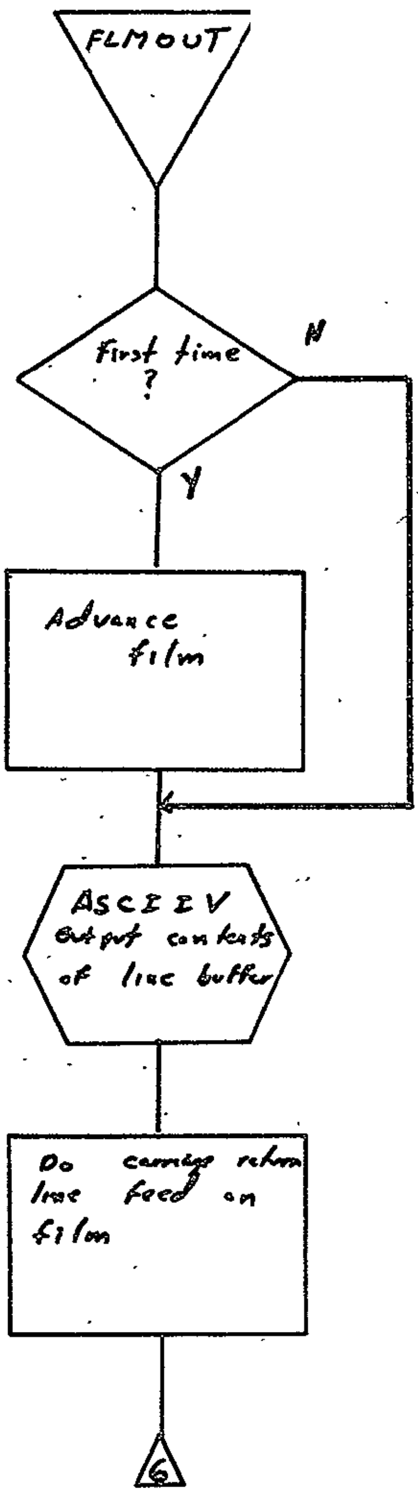

PDP
Zero FOT, CHRFCT
LINCNT, ADVI, IFLG
Set CURBUF,
Do FC7CLR, FRSPIC
Initialize FCCUTS
to SKP instruction,
INXSSW to NOP
instruction
MTRINI
Initialize tape
routines
JSEP
Read, decode
tape label &
place on film
1

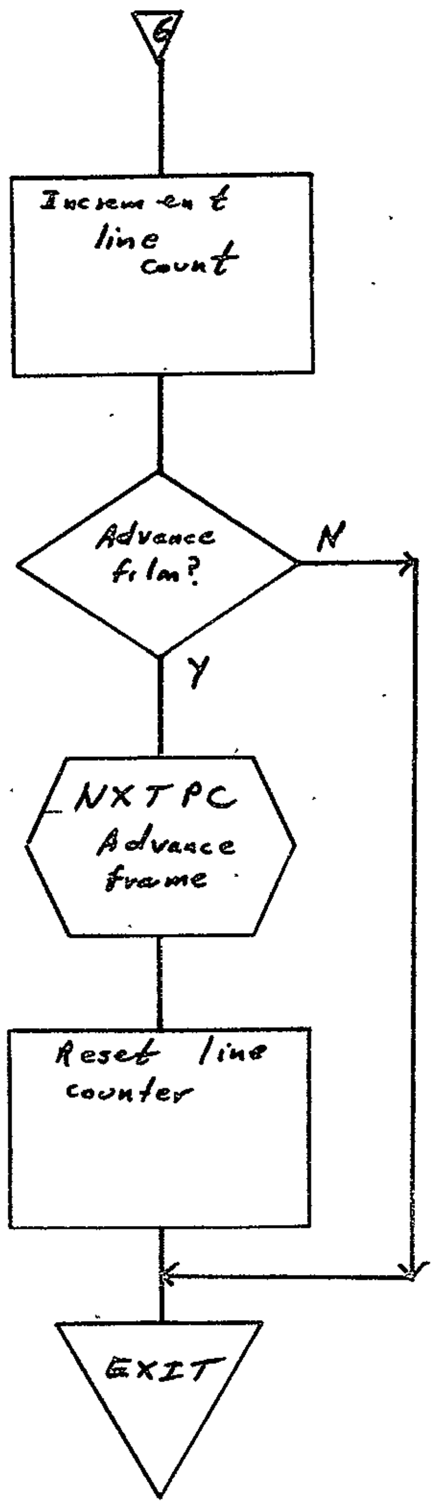

1
OUTTTY
Output tape label to teleprinter
TTYCRC
Read COM controls from TTY
GETT
Get character from tape and increment counter
A
Carriage return? 15₈
N
B
Y
Previous character line feed? 12₈
N
C
Y
2

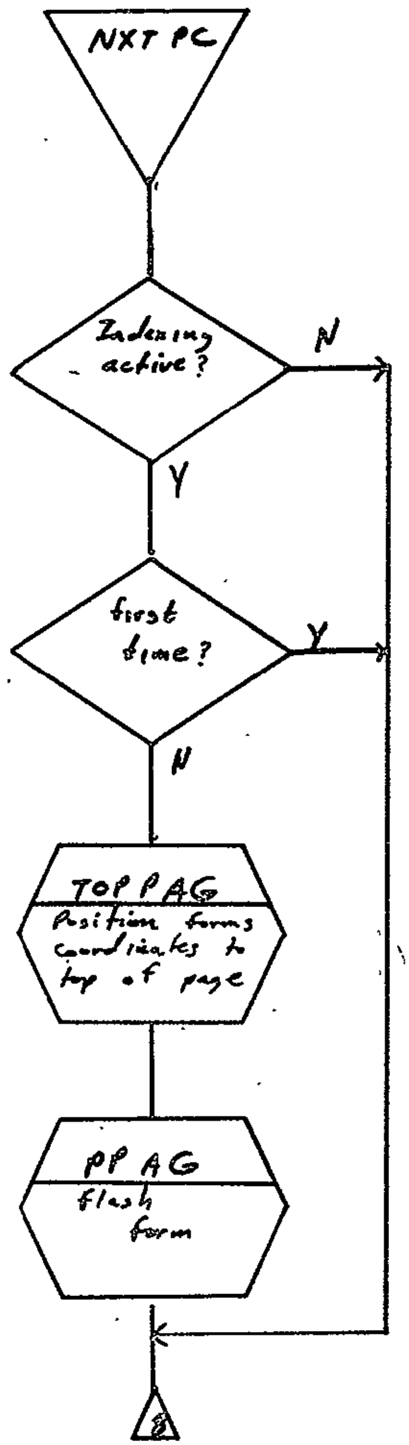

2
FLMOUT
Output contents of current line buffer to film
B
Reset line character pointer to zero
C
line feed 12₈
Y
A
N
first character?
N
D
Y
3

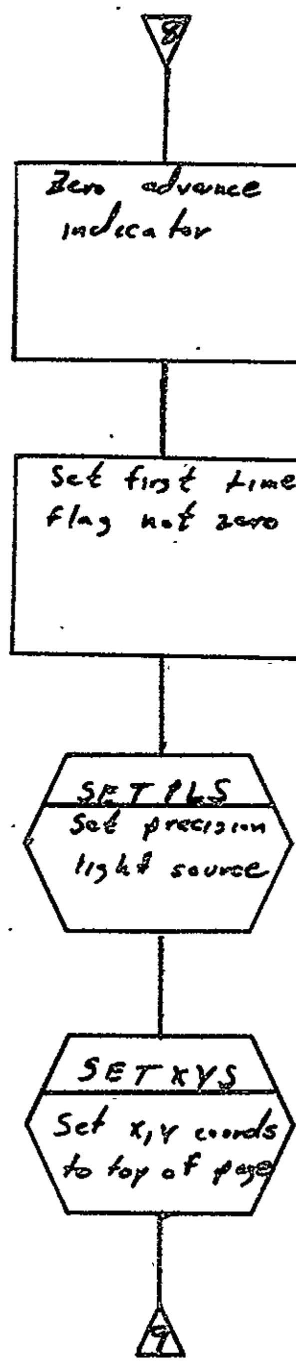

3
+
control
character?
Y
A
N
previous
character = line
feed 12$_8$
N
Y
FLMOUT
Set ADVZ
output a line
of characters
KYBLIS
Enter monitor
for interrupts
0
control
character
N
D
Y
4

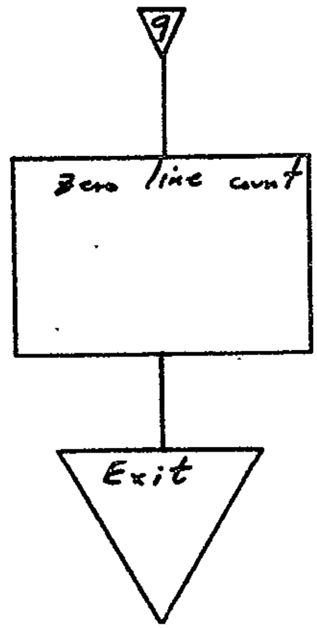

4
Do a carriage return, line feed on film
D
first character = 1
Y
A
N
PUTC
Place character in line buffer
A
A

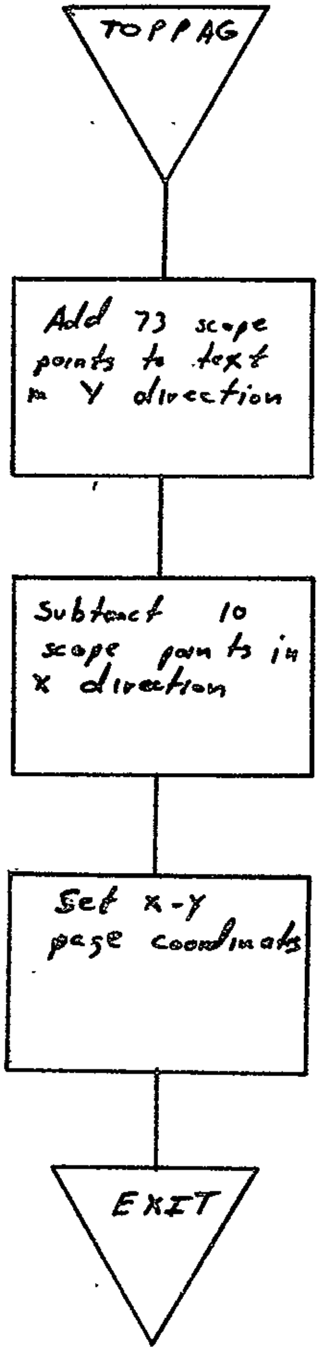

FLMOUT
First time ?
N
Y
Advance film
ASCIIV
Output contents of line buffer
Do carriage return line feed on film
6

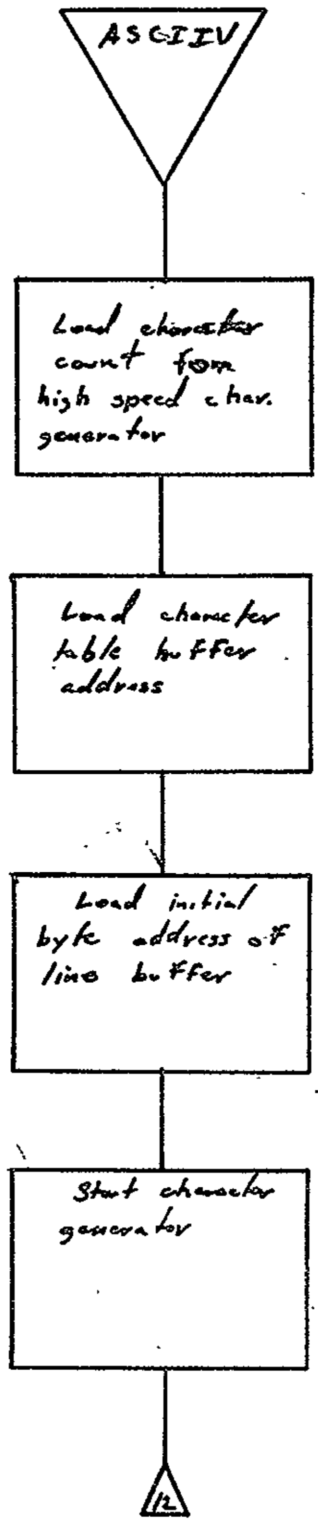

6
Increment line count
Advance film?
N
Y
NXTPC Advance frame
Reset line counter
EXIT

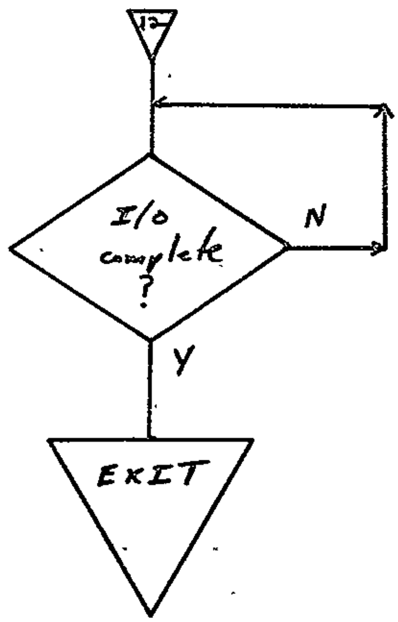

NXT PC
Indexing active?
N
Y
first time?
Y
N
TOP PAG
Position forms coordinates to top of page
PPAG
flash form
8

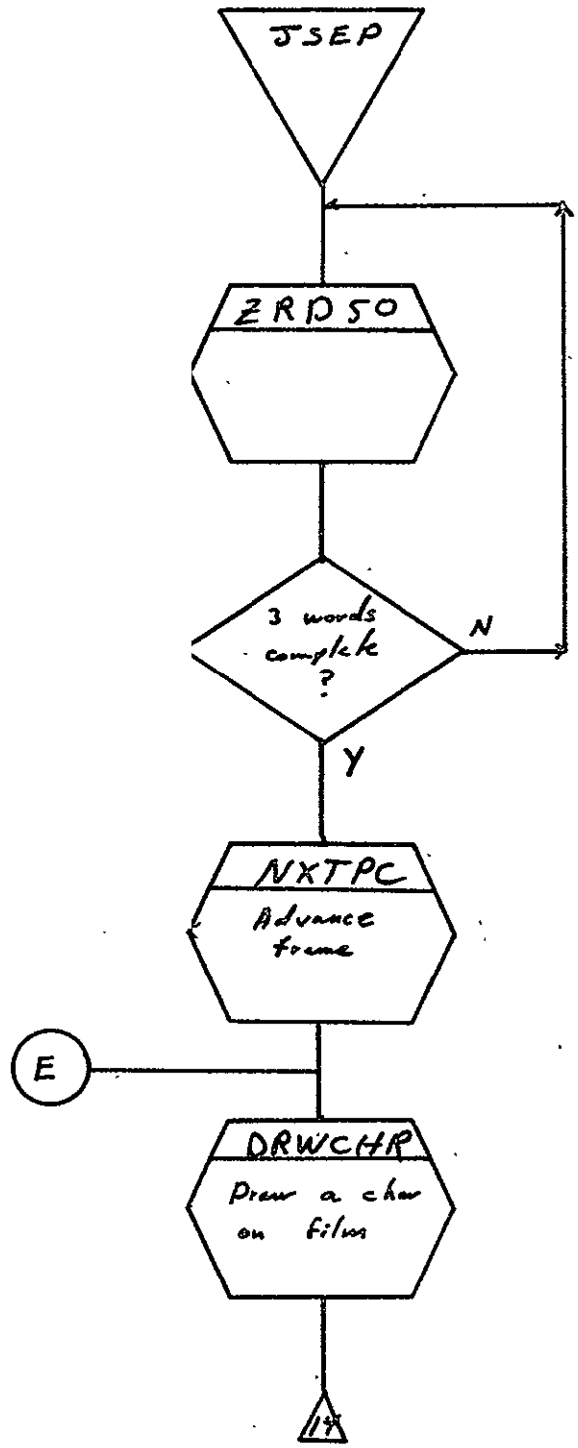

8
Zero advance indicator
Set first time flag not zero
SETPLS
Set precision light source
SETXYS
Set x,y coords to top of page
9

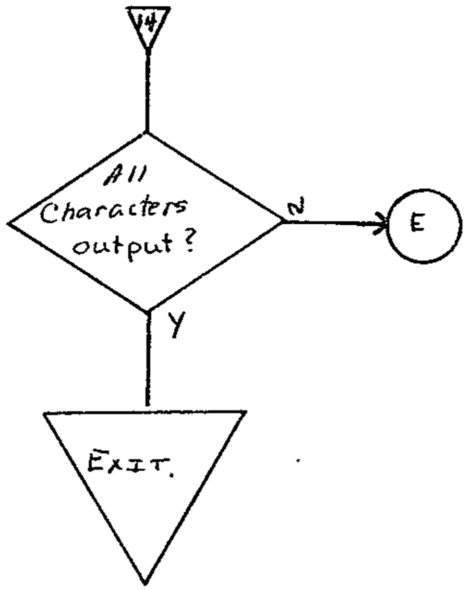

9
zero line count
Exit

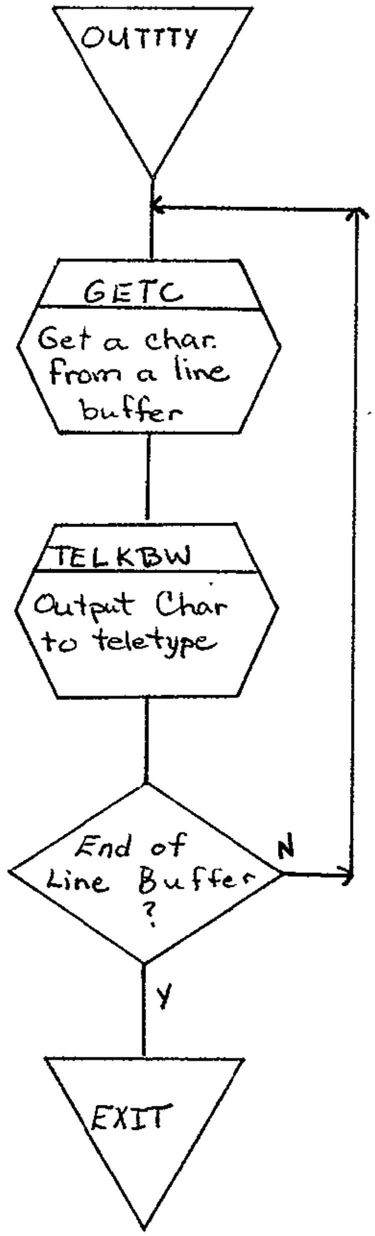

TOPPAG
Add 73 scope points to text in Y direction
Subtract 10 scope points in x direction
Set x-y page coordinats
EXIT

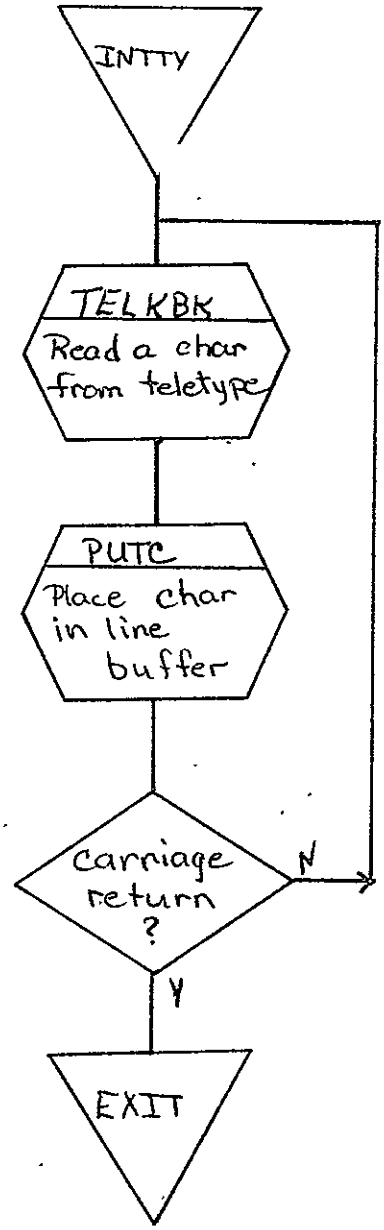

ASCIIV
Load character count from high speed char. generator
Load character table buffer address
Load initial byte address of line buffer
Start character generator
12

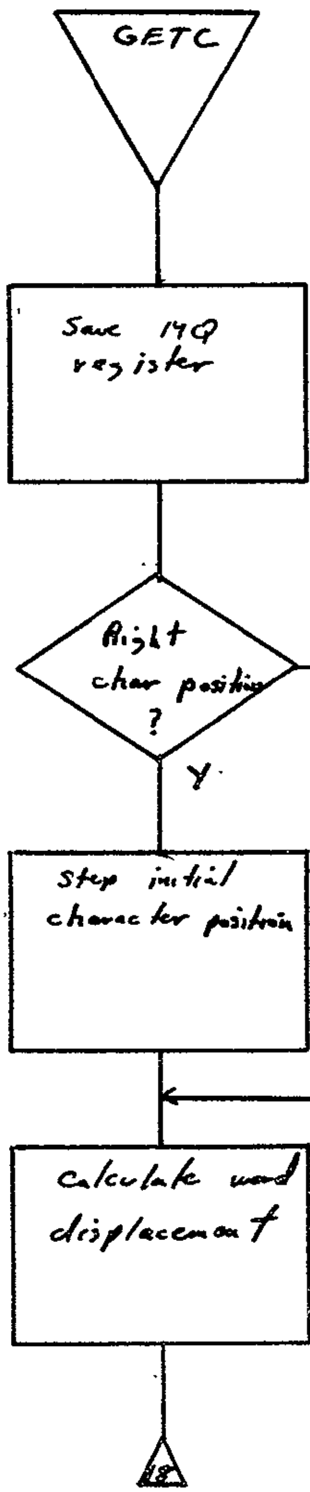

12
I/O complete ?
N
Y
EXIT

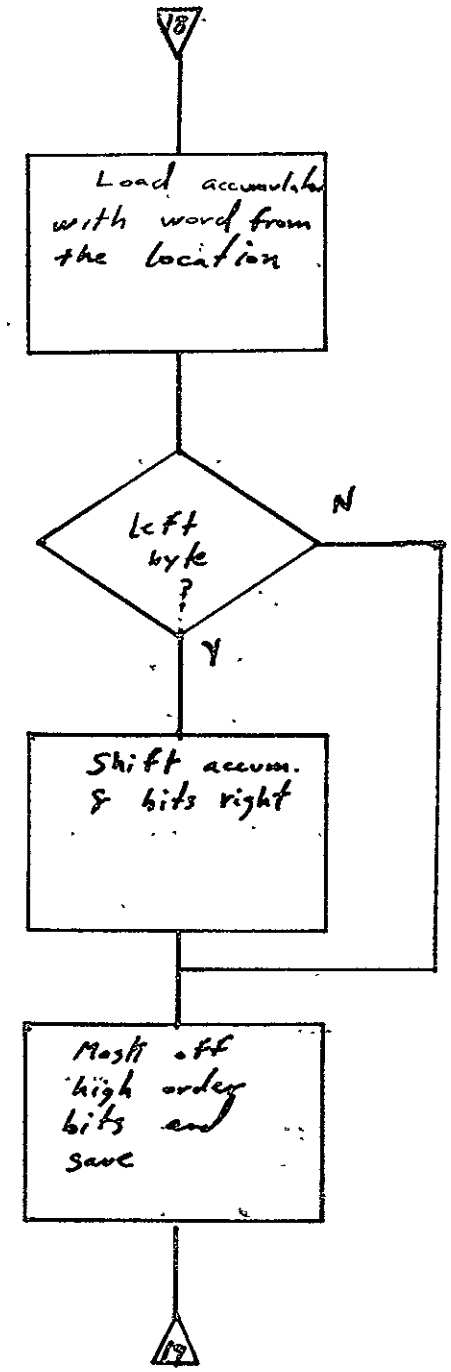

JSEP
ZRD50
3 words complete ?
N
Y
NXTPC
Advance frame
E
DRWCHR
Draw a char on film
14


14
All Characters output?
N
E
Y
EXIT.

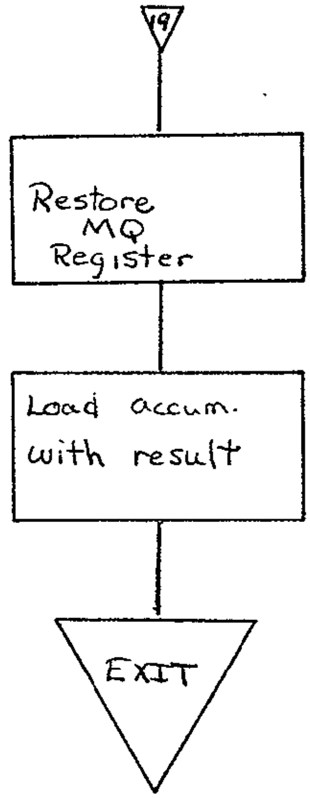

OUTTTY
GETC
Get a char.
from a line
buffer
TELKBW
Output Char
to teletype
End of
Line Buffer
?
N
Y
EXIT

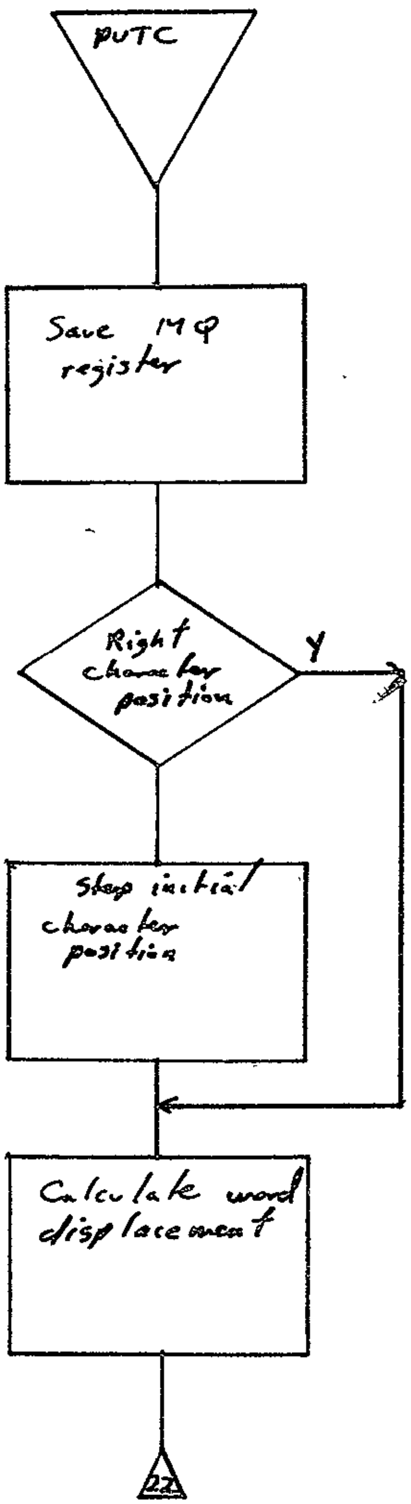

INTTY
TELKBK
Read a char from teletype
PUTC
Place char in line buffer
carriage return ?
N
Y
EXIT

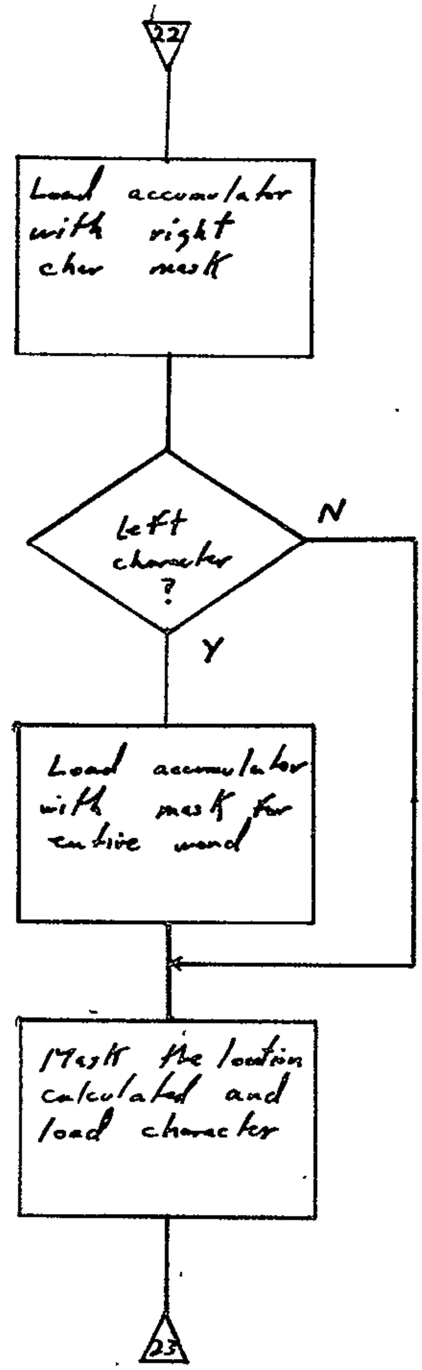

GETC
Save 14Q register
Right char position ?
N
Y
Step initial character position
calculate word displacement
18

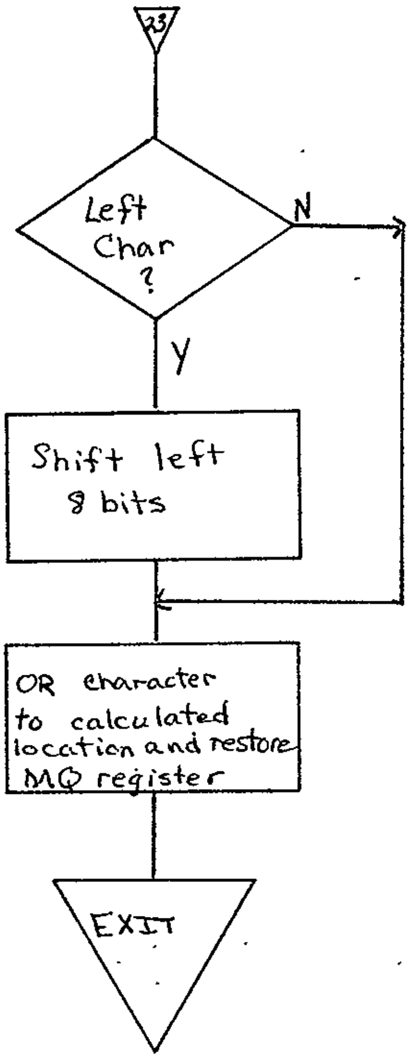


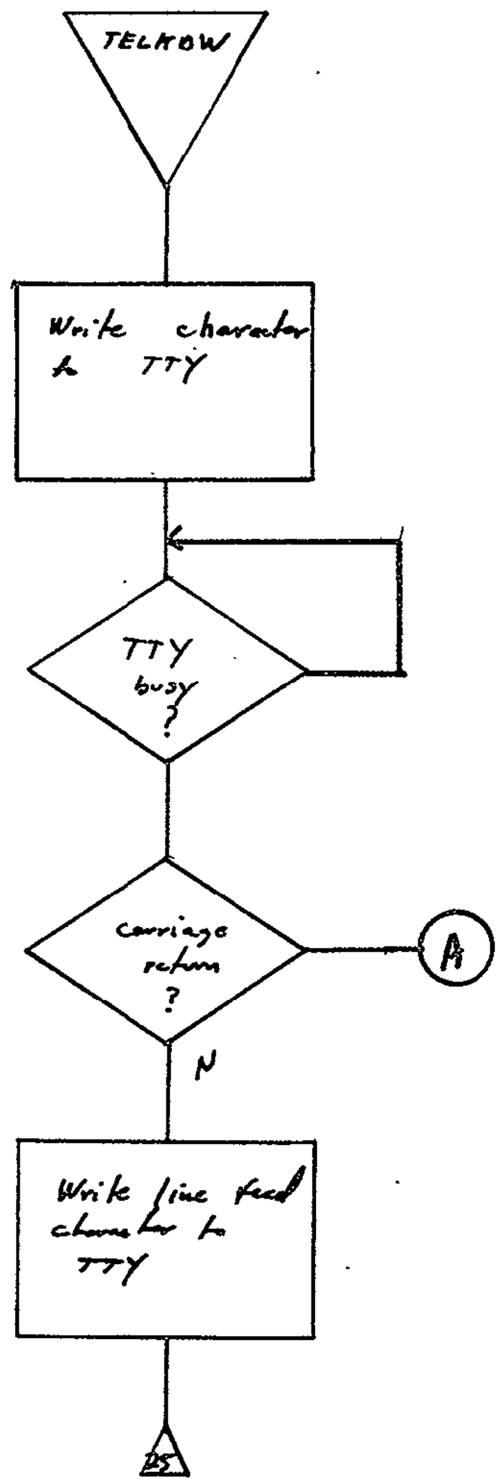
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

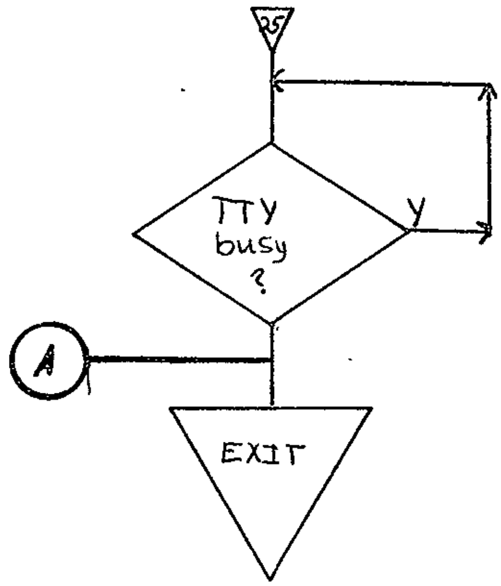

19
Restore
MQ
Register
Load accum.
with result
EXIT

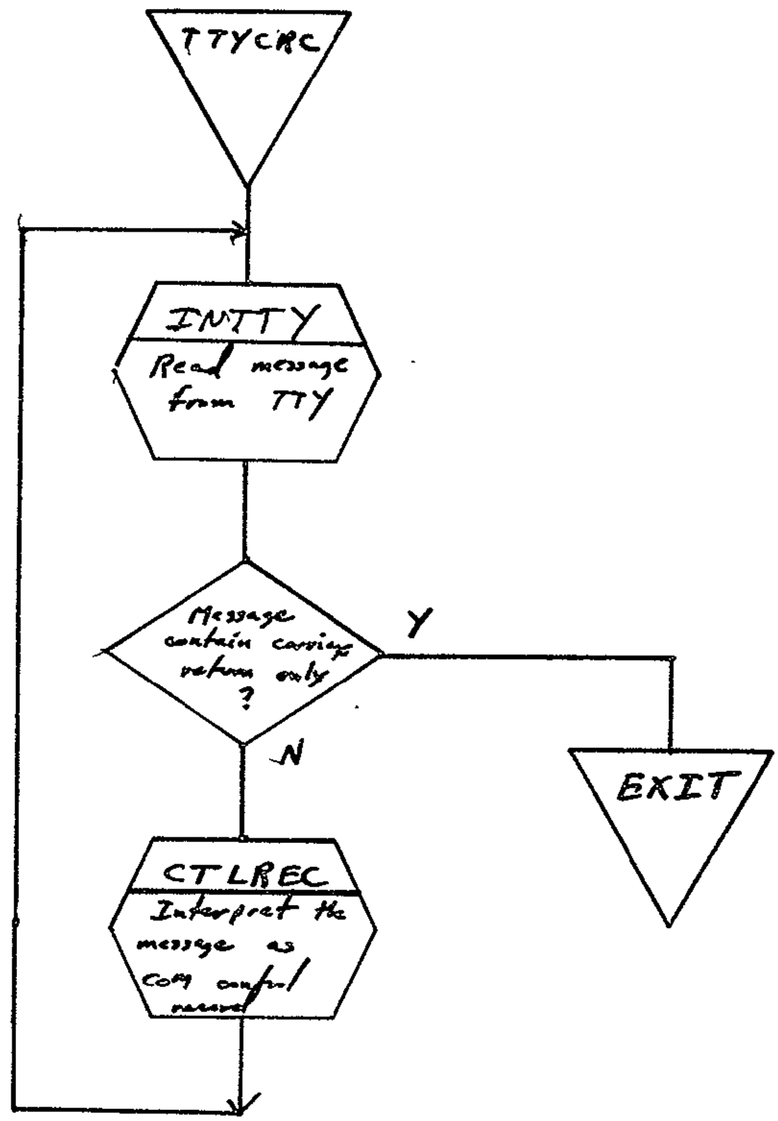

PUTC
Save MQ register
Right character position
Y
Step initial character position
Calculate word displacement
22

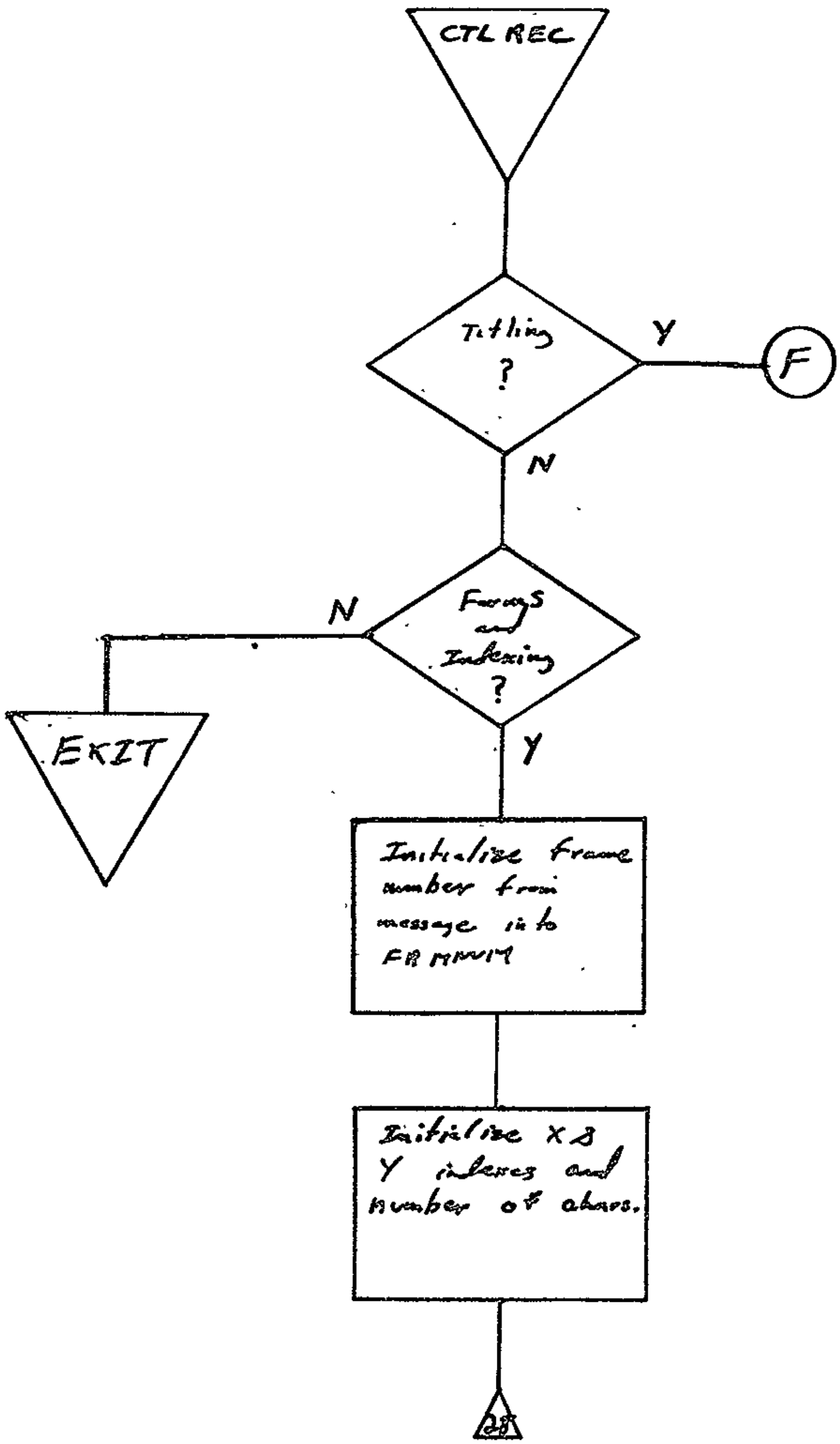

22
Load accumulator with right char mask
Left character ?
N
Y
Load accumulator with mask for entire word
Mask the location calculated and load character
23

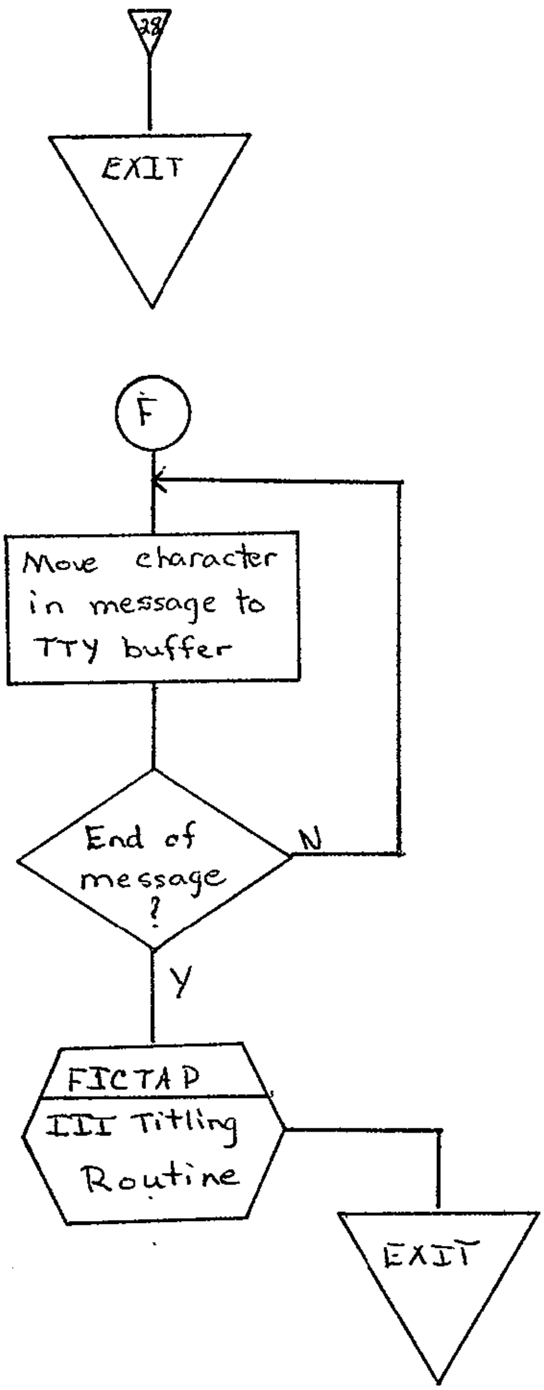

23
Left Char ?
N
Y
Shift left 8 bits
OR character to calculated location and restore MQ register
EXIT

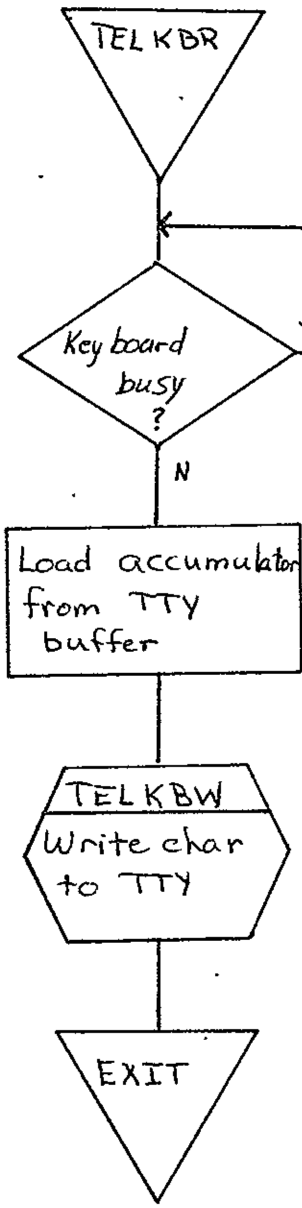

TELKOW
Write character to TTY
TTY busy ?
carriage return ?
A
N
Write line feed character to TTY
25


25
TTY
busy
?
Y
A
EXIT


TTYCRC
INTTY
Read message from TTY
Message contain carriage return only ?
Y
N
EXIT
CTLREC
Interpret the message as com control record


CTL REC
Titling ?
Y
F
N
Forms and Indexing ?
N
EXIT
Y
Initialize frame number from message into FRMNUM
Initialize X & Y indexes and number of chars.
28


38
EXIT
F
Move character in message to TTY buffer
End of message ?
N
Y
FICTAP
III Titling Routine
EXIT


TELKBR
Keyboard busy ?
Y
N
Load accumulator from TTY buffer
TELKBW
Write char to TTY
EXIT

2.8 COMA HARVARD COLLEGE OBSERVATORY SOLAR EXPERIMENT S055 GRAY-LEVEL 9-TRACK PROCESSOR (S055)

2.8.1 Background

A. Author. F. C. Ashton, Aeronutronic Ford Corp.

B. Intent. S055 is requested when a Harvard College Observatory Solar Experiment S055 gray-level 9-track has been submitted for data to be output to 105 mm fiche.

C. Program History

1. Production Tape Date. 28 November 1973

2. Author. F. C. Ashton

3. Authorization. FR80 microfilm system task A13

4. Test Case. Test tape requirement, specification SH-25723.

5. Revisions. Reference Appendix B, paragraph B.8.

2.8.2 Introduction

2.8.2.1 Hardware Requirements

- FR80 with 12K memory
- 9-track tape unit
- 105 mm fiche camera.

2.8.2.2 Software Requirements. The following files, found in I.I.I.'s SYM Directory, are required.

III109	III163	III162	III161 GO
III166	III185	III161	III186
III164	III147	III188	

2.8.2.3. Assembly Parameters. The assembly parameters in III109 should be set for the proper machine configuration. Assembly parameters specific to S055 program are as follows.

A. FONT. If 0, indicates standard I.I.I. character font.

B. TAPELB. If 1, indicates standard IBM tape labels.

C. NASA. If 1, defines special characters used at JSC.

D. EBCDIC. If 1, indicates standard IBM EBCDIC character set.

E. LOCASE. If 1, indicates lower case character set.

F. BIGBUF. If 1, allows maximum amount of features with minimum buffer space.

G. MTSIZE. Defines length of system tape buffers (513 words).

H. MTTSIZE. Defines length of teletype buffer (192 words).

I. MANYUP. Indicates that page count is printed with frame count when the accounting information is output to the teletype.

J. FTYPE. Indicates the fiche camera.

K. DSKMON. Indicates that disk monitor routine to be assembled

L. NEXPAG. Equivalent to NEXPIC routine.

M. NODISP. Allows assembly without monitor display.

N. TITLE. Allows assembly with fiche title.

2.8.2.4 Operator Commands

```
*
*TIME=44.0"
*FRAME=0
*GO
*CONTINUE
*TITLE
*END JOB
*CLEAR
*REWIND
*SKIP
*TRY AGAIN
*STANDARD LABELS
*UNLABELLED
*PITCH/MARGIN
*SIZE OF TITLE=14500,10500
*IMAGES/FICHE
*FOCUS
*LOAD=MONITO
*← - ROTATED
*↑ - UPRIGHT
*
*DEBUG
```

2.8.3 Analysis

2.8.3.1 Major Control Section

A. Description. Control is given to the S055 Program at the location BEGIN. The tape handler is initialized by calling MTRINI, with MTAREA being set to the tape buffer address of EXPND and PBUFSZ set to 700 words. TPOINT, the pointer for fiche titles, is set to begin at the title table, FICTBS.

The program makes a call to the TREC Subroutine to process the title record. A call to the HDREC Subroutine processes three header lines per page of gray data. The starting X and Y coordinates for gray-level data are set by calling the SETXYS Subroutine. The number of records per gray-level page, LNCNT, is set to 60.

At the tag REPLN, the parameter for the Read Subroutine, RDWD, and the Get Subroutine, GTIN, are initialized. The address for the line identification is saved off by a call to SETAD. The subroutine PESET sets spacing for gray-level pixel.

At the tag RSMLN, the number of input pixels, PEXCT, is set to 120 and the subroutine GTIN is called to output a pixel line to film. The switch GTSW is set to NOP to pick-up pixel data from TABBUF Table. The same line of data is repeated nine times. The eight characters of line ID are output by calling the ECBCD Subroutine. Then a line of gray pixel is output again. The last four characters of the record are output.

The program returns to tag REPLN until 60 lines of pixel data have been processed. Then the fiche is advanced one frame. The program continues this loop starting at the tag HEADER until the end-of-file is reached.

B. Input/Outputs

1. Input. Data shall be input from a 9-track drive. The tape can be standard IBM label, nonstandard label or

unlabeled. The data shall be in a fixed length record format (blocked) with 1320 eight-bit bytes per block. Each logical record shall be 132 bytes in length. A logical record contains a title record or gray-level record. A title record has HEX D9 in the first byte of record. Byte 2 contains an EBCDIC T, followed by 130 bytes of title information. A gray-level record has eight bytes of EBCDIC characters, followed by 120 bytes of pixels and the four bytes of EBCDIC characters.

2. Output. Output of data is on 105 mm fiche (six rows by six columns). The first row is reserved for title information.

3. Message Output. CONTROL ERROR is output to the teletype when the first logical record on the file is not a title record. TITLE ERROR is output to the teletype when the title record is in error.

C. Linkages

1. External

Routine	Program
FCFIN	III166 ADVAN
FC7CLR	III166 ADVAN
FICTAP	III188
FRSPIC	III166 ADVAN
GETANM	III161
GETT	III163
KYBLIS	III166
MONOUX	III166
MONOUT	III166 INVAR
MTLAC	III166
MTRINI	III163
NEXPIC	III160 ADVAN
MNBRIT	III166
PSTLL	III166
SETPLS	III166
SETXYS	III166

2. Internal Routines

BUM	GTIN	PLSET	SETAD
DUMRD	MVCOM	RDWD	TREC
ECBCD	PESET	RSRT	

2.8.3.2 Subroutines

A. BUM. Subtracts 1 from read pointer address, MTPTR, and read word count, MTCNT. Calling sequence: JMS BUM.

B. DUMRD. Sets the read pointer to logical records and calls MTLAC when a new physical block of data is requried. Calling sequence: JMS DUMRD.

C. ECBCD. Outputs a line of EBCDIC characters to film. Calling sequence where the first LAC is the address of the buffer and the second is the negative number of character:

```
LAC
DAC ADDSV
LAC
JMS ECBCD
```

D. GTIN. Gets a pixel value and outputs the pixel five times to film. When the GTSW switch is set to a SKIP, the pixel value is picked up from the tape buffer, complemented and stored in the table TABBUF. When the GTSW switch is set to NOP, the pixel is picked up from TABBUF. Calling sequence:

```
LAC (SKP OR NOP)
DAC GTSW
JMS GTIN
```

E. HDREC. Calls to check for console intervention, SETXYS to set the starting X and Y coordinate, and PLSET to set the spacing for ALPHA MODE. The subroutine outputs three lines of header information. Calling sequence: JMS HDREC.

F. MVCOM. Moves the title record from the tape buffer to the title buffer. Calling sequence: JMS MVCOM.

G. PESET. Sets the spacing and spot size for gray-level output. CHDELX, the X delta spacing, is set to 10 and CHDELY, the Y delta spacing, is set to 10. The spot size is set to 5. Calling sequence: JMS PESET.

H. PLSET. Sets the spacing and spot size for alphanumeric data. CHDELX, the X delta spacing, is set to 65 and CHDELY, the Y delta spacing, is set to 50. The character size is set to 6 and intensity to 48. Calling sequence: JMS PLSET.

I. RDRT. Saves the parameters for the tape handler. MTCNT is the word count; MTPTR is address of current line within the buffer. MTBYTW contains next half-word of line. MTBYTC is number of bits in last word. Calling sequence: JMS RDPT

J. RDWD. Saves the first eight characters of the line in temporary buffer and stores intensity in INT. When the routine is initialing call for line, RDSW1 is set to skip and first eight characters saved. Then RDSW1 is set to NOP for access of the gray-level intensity. Calling sequence, where DAC RDSW1 initially calls for line data:

```
LAC (SKP)
DAC RDSW1
JMS RDWD
```

K. RSRT. Restores parameter for tape handler. Calling sequence: JMS RSRT.

L. SETAD. Loads address of character buffer into ADDSV. Calling sequence: JMS SETAD.

M. TREC. Checks first logical record for title control record. If record is not title record, the program prints out CONTROL ERROR and returns to MONITOR. If record is title record, the subroutine processes the title. Calling sequence: JMS TREC.

2.8.3.3 Constants and Variables

A. External

1. CHDELX. Variable that contains X spacing.

2. CHDELY. Variable that contains Y spacing.

3. CHRSIZ. Variable that contains character size.

4. FCXCNT. Constant that contains row count of 6.

5. FCYCNT. Constant that contains column count of 7.

6. FICMAR. Constant -100 fiche margin.

7. FICFRM. Constant -64 fiche pitch.

8. FICTB. Buffer where title information is stored.

9. MAXTRW. Variable used by III185 title routine. The program initializes MAXTRW to zero.

10. MTAREA. Constant which has the address of tape buffe

11. MTBYTC. Variable used to count number of bits used in III163.

12. MTCNT. Variable containing number of words remaining in tape buffer.

13. MTPTR. Variable which is pointer into tape buffer.

14. MTTARE. Constant which has the address of title buffer.

15. RECPIN. Variable to hold the intensity.

16. RECSPT. Variable to hold spot size.

17. XTITS. Constant starting X coordinate of title (= 14500).

18. YTITS. Constant starting Y coordinate of title (= 10500).

B. Internal

1. ADDSV. Variable containing address of character buffer CHRBUF.

2. ALPHX. Constant of 5042; starting X coordinate of alphanumeric characters.

3. ALPHY. Constant of 10047; starting Y coordinate of alphanumeric characters.

4. CHDELX. Constant of 65; X spacing for alphanumeric characters.

5. CHDELY. Constant of 50; Y spacing for alphanumeric characters.

6. CTLMES. Message CONTROL ERROR output to TTY when first record on tape is not a COM control record.

7. INT. Variable; temporary hold for intensity.

8. INTHD. Variable; transposed intensity.

9. INTOUT. Constant of 3; title intensi[illegible]

10. LNCNT. Variable; line count per fra[illegible]

11. PEDELX. Constant of 10; X spacing for gray-level pixel.

12. PEDELY. Constant of 10; Y spacing for gray-level pixel.

13. PEXX. Constant of 5446; starting X coordinate for first gray-level pixel of image.

14. PEXY. Constant of 10097; the starting Y coordinate for first gray-level pixel of image.

15. PEXCT. Variable used to hold pixels per line.

16. PNTCT. Variable used to hold number of pixel repeats

17. RRLN. Variable to hold the repeat line count.

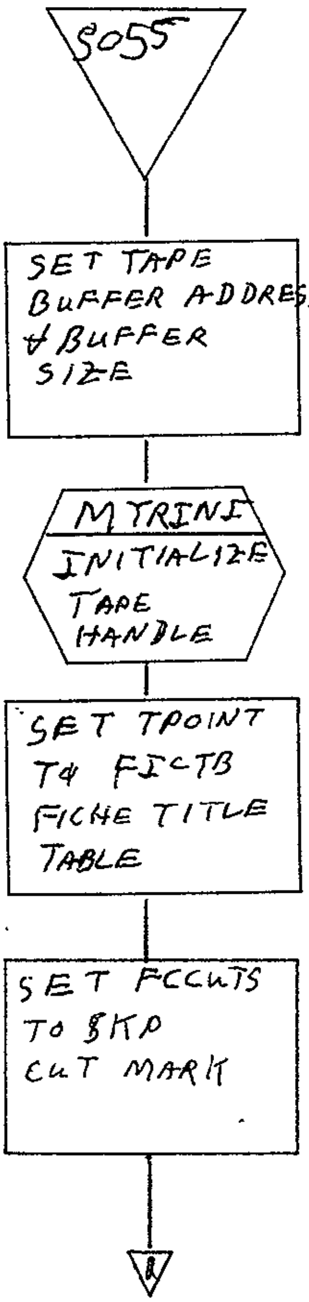
18. SPSIZ. Constant of 5; character size of EBCDIC character.

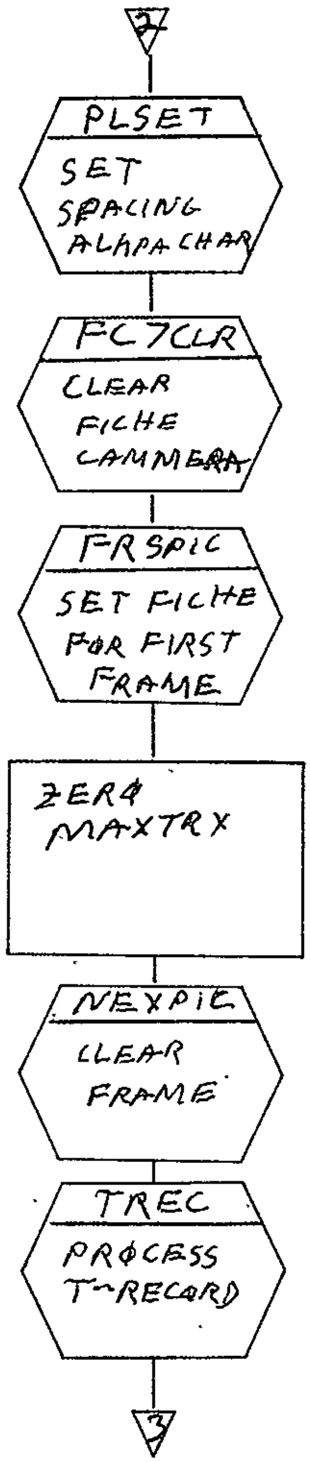
19. TABBUF. Variable buffer of 120 words where the trans posed intensities are stored.

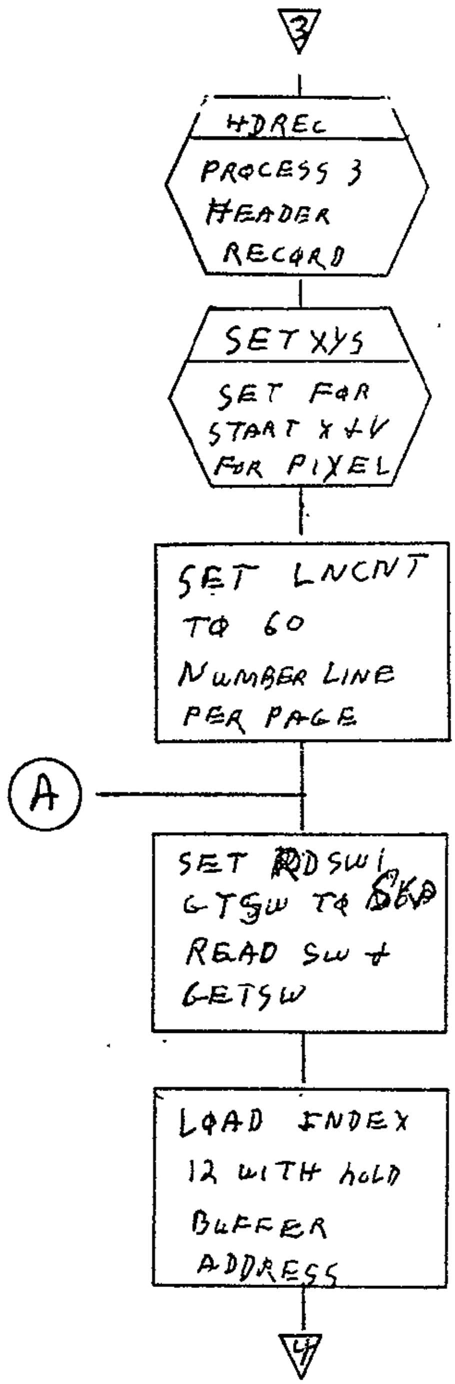
20. TABINT. Constant table of 64 words used to transpose intensity.

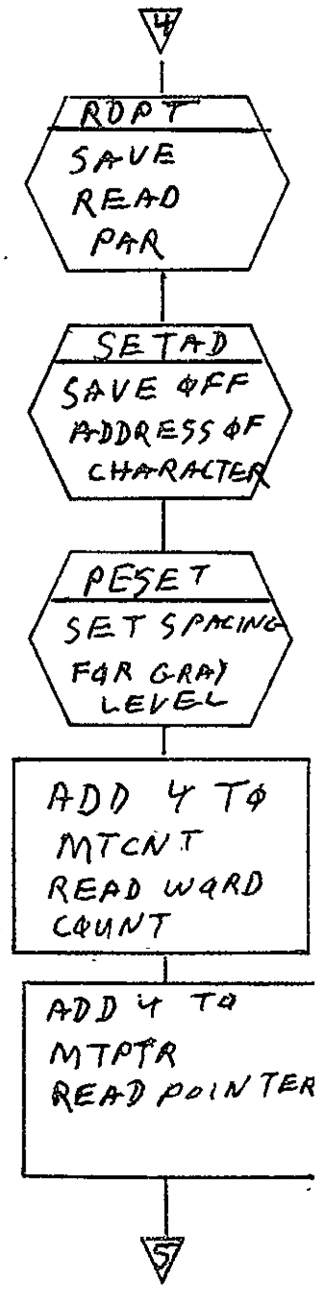
21. TMPCT. Variable temporary storage and count.

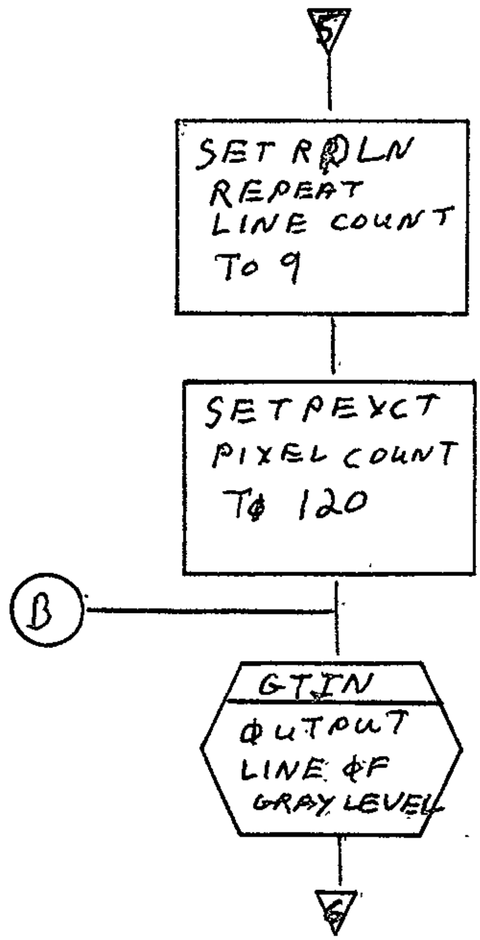
2.8.3.4 Flow Charts. See following pages.

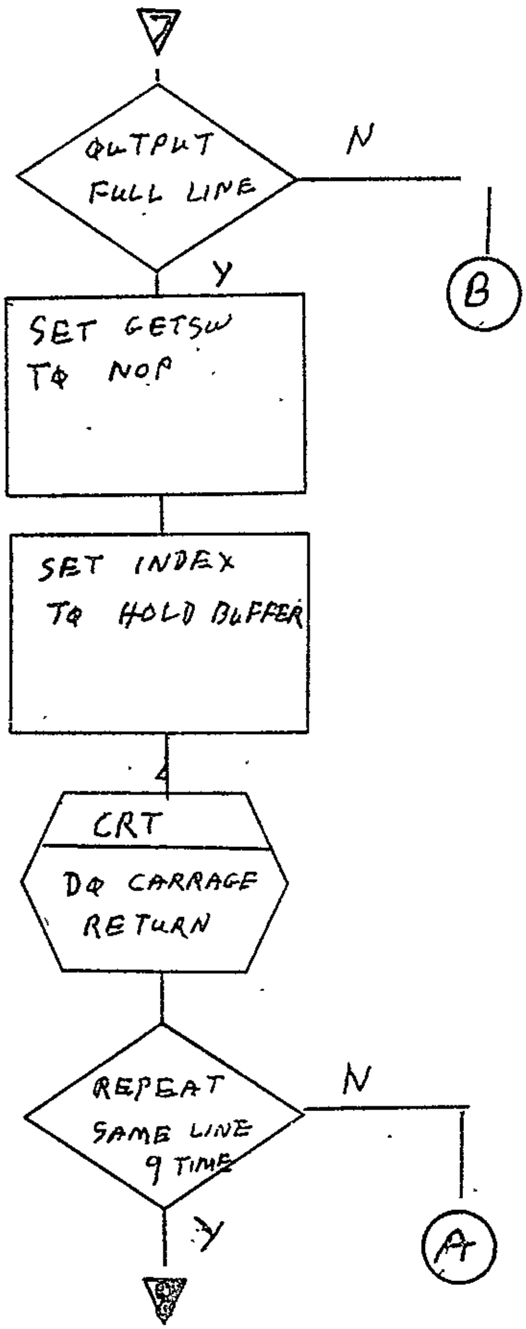

8055
SET TAPE BUFFER ADDRESS & BUFFER SIZE
MTRINI
INITIALIZE TAPE HANDLE
SET TPOINT TO FICTB FICHE TITLE TABLE
SET FCCUTS TO 8KP CUT MARK

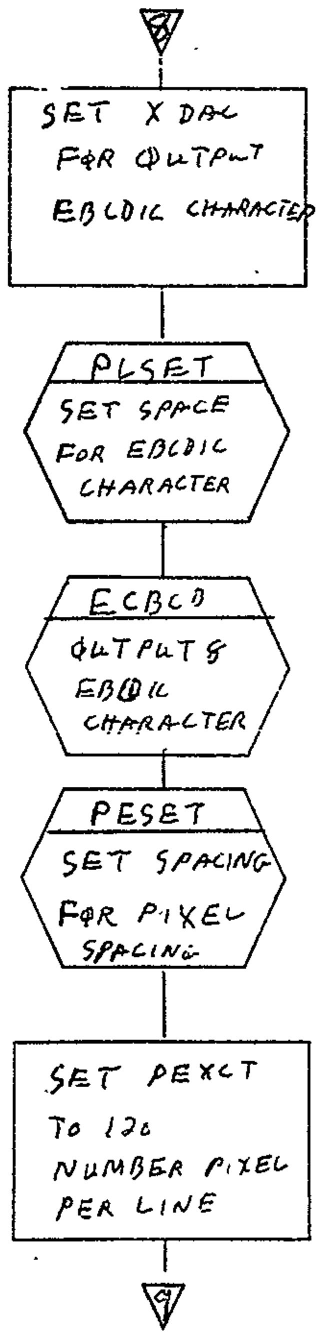

2
PLSET
SET SPACING ALHPA CHAR
FC7CLR
CLEAR FICHE CAMMERA
FRSPIC
SET FICHE FØR FIRST FRAME
ZERØ MAXTRX
NEXPIC
CLEAR FRAME
TREC
PRØCESS T-RECORD
3


3
HDREC
PROCESS 3 HEADER RECORD
SETXYS
SET FOR START X + Y FOR PIXEL
SET LNCNT TO 60 NUMBER LINE PER PAGE
A
SET RDSWi GTSW TO SKP READ SW + GETSW
LOAD INDEX 12 WITH hold BUFFER ADDRESS
4

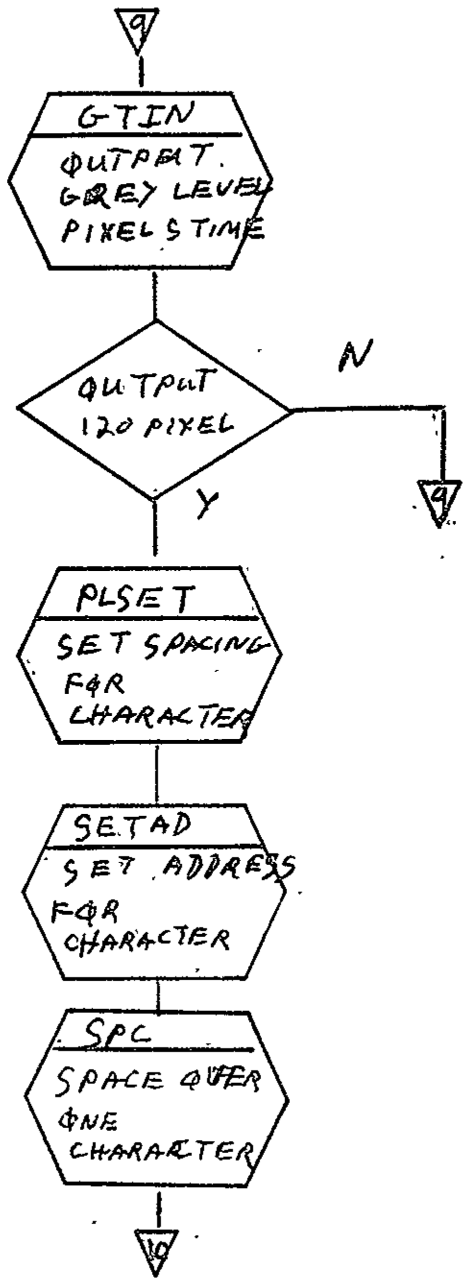

4
RDPT
SAVE
READ
PAR
SETAD
SAVE OFF
ADDRESS OF
CHARACTER
PESET
SET SPACING
FOR GRAY
LEVEL
ADD 4 TO
MTCNT
READ WORD
COUNT
ADD 4 TO
MTPTR
READ POINTER
5

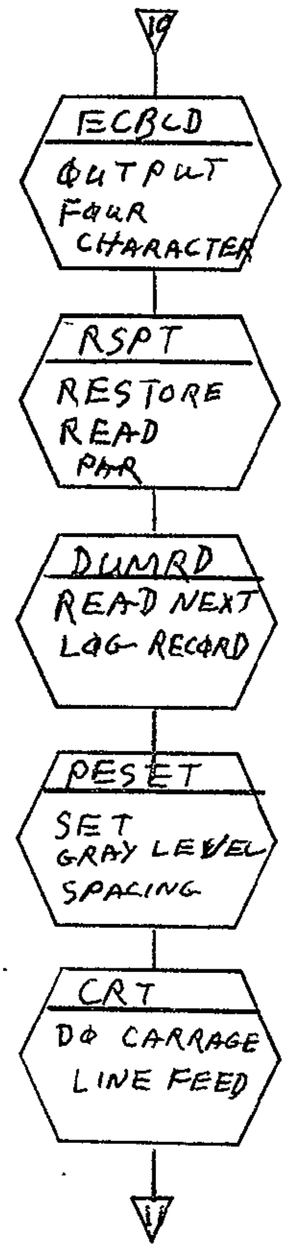

5
SET RØLN
REPEAT
LINE COUNT
TO 9
SETPEXCT
PIXEL COUNT
TØ 120
B
GTIN
ØUTPUT
LINE ØF
GRAY LEVEL
6

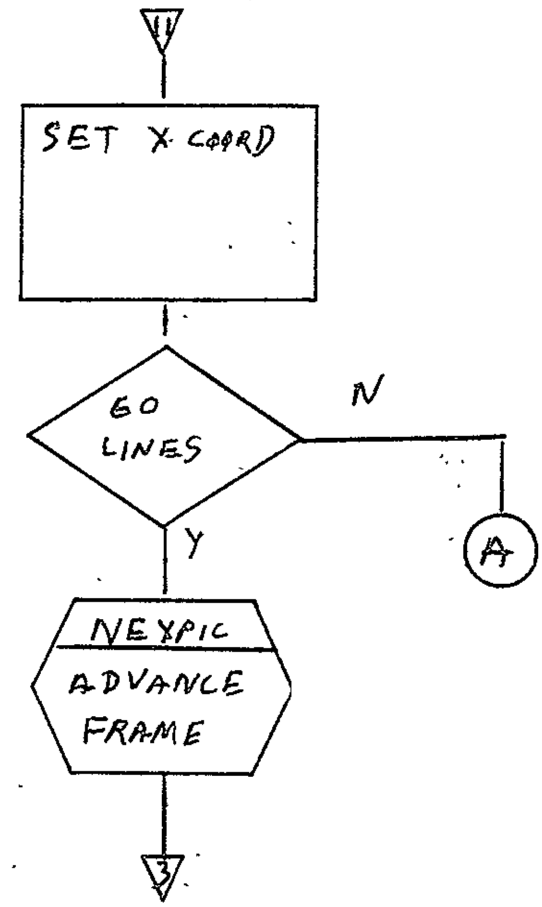

7
OUTPUT FULL LINE
N
Y
B
SET GETSW TO NOP
SET INDEX TO HOLD BUFFER
CRT
DO CARRAGE RETURN
REPEAT SAME LINE 9 TIME
N
Y
A
8

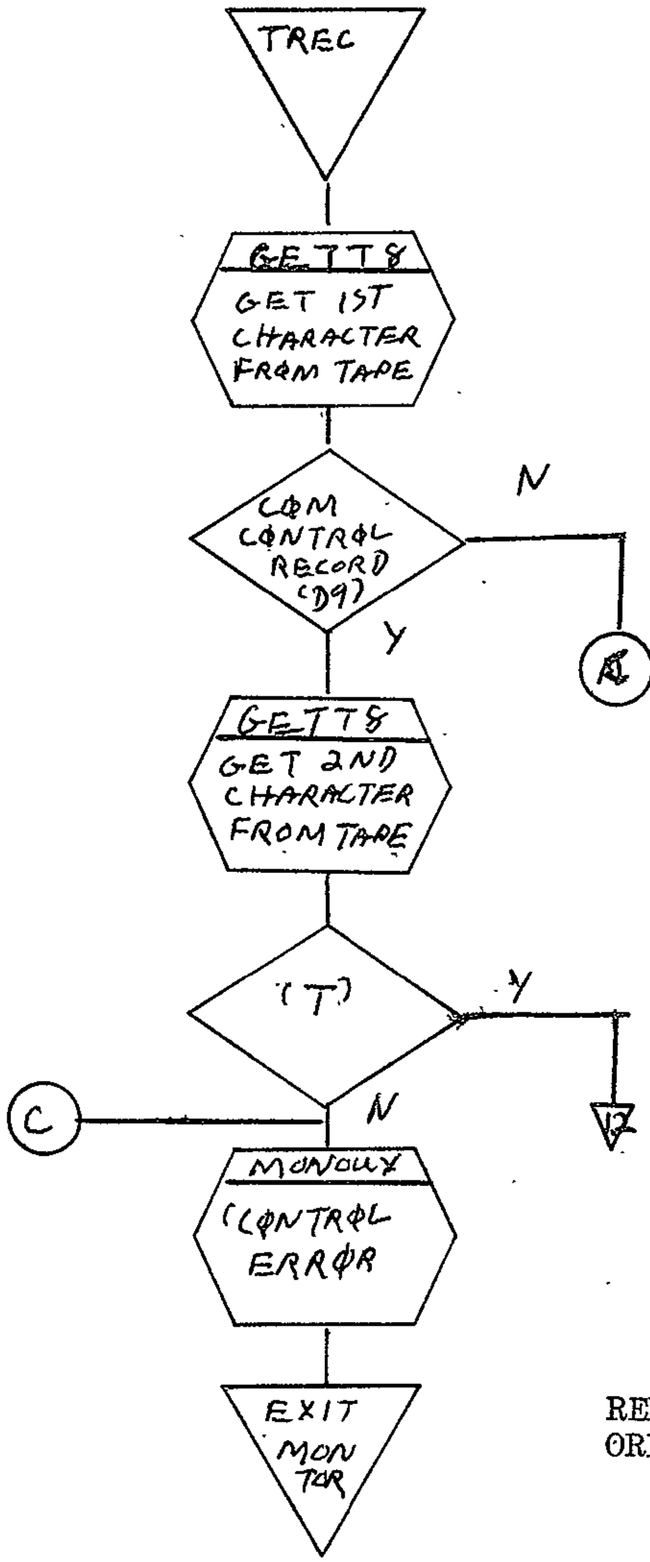


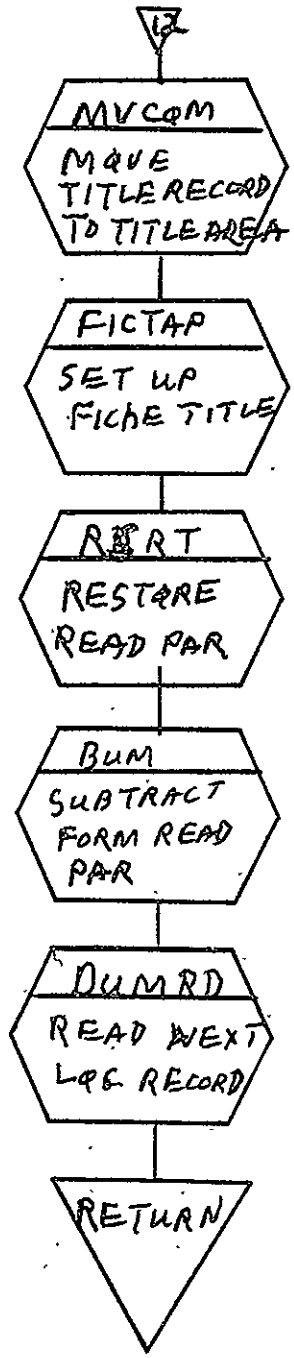
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

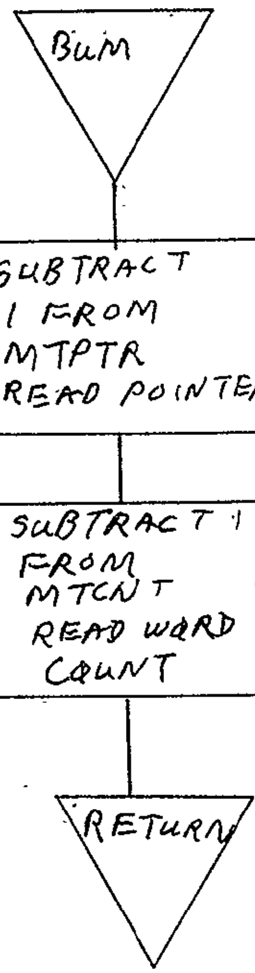

9
GTIN
OUTPUT GREY LEVEL PIXELS TIME
OUTPUT 120 PIXEL
N
9
Y
PLSET
SET SPACING FOR CHARACTER
SETAD
SET ADDRESS FOR CHARACTER
SPC
SPACE OVER ONE CHARACTER
10

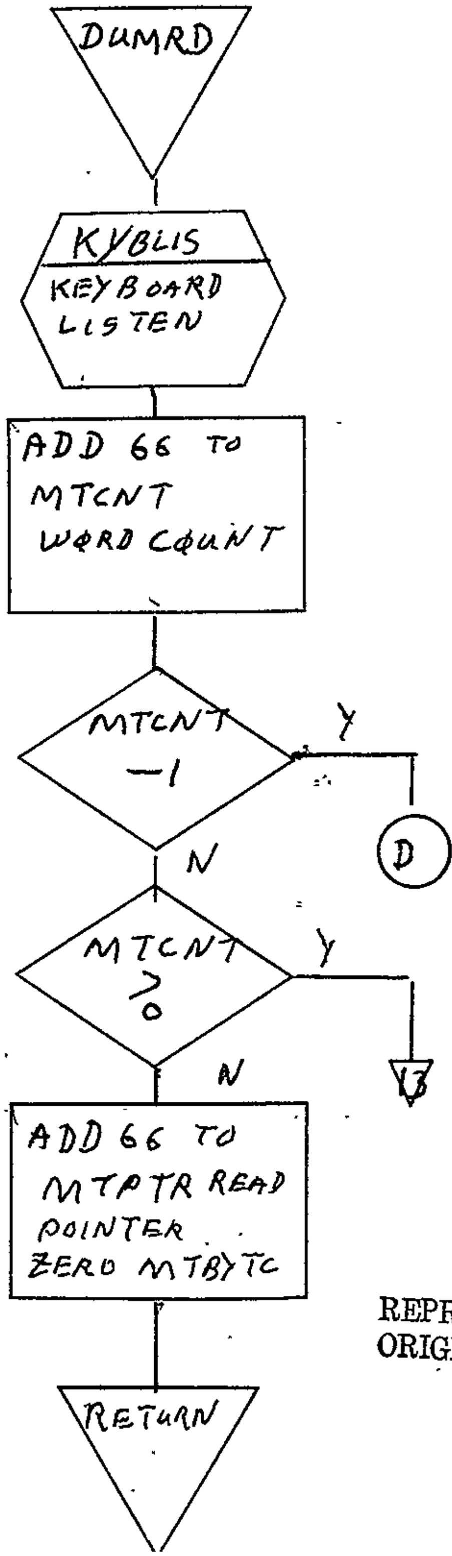

19
ECBCD
OUTPUT FOUR CHARACTER
RSPT
RESTORE READ PAR
DUMRD
READ NEXT LOG RECORD
PESET
SET GRAY LEVEL SPACING
CRT
DO CARRAGE LINE FEED
11

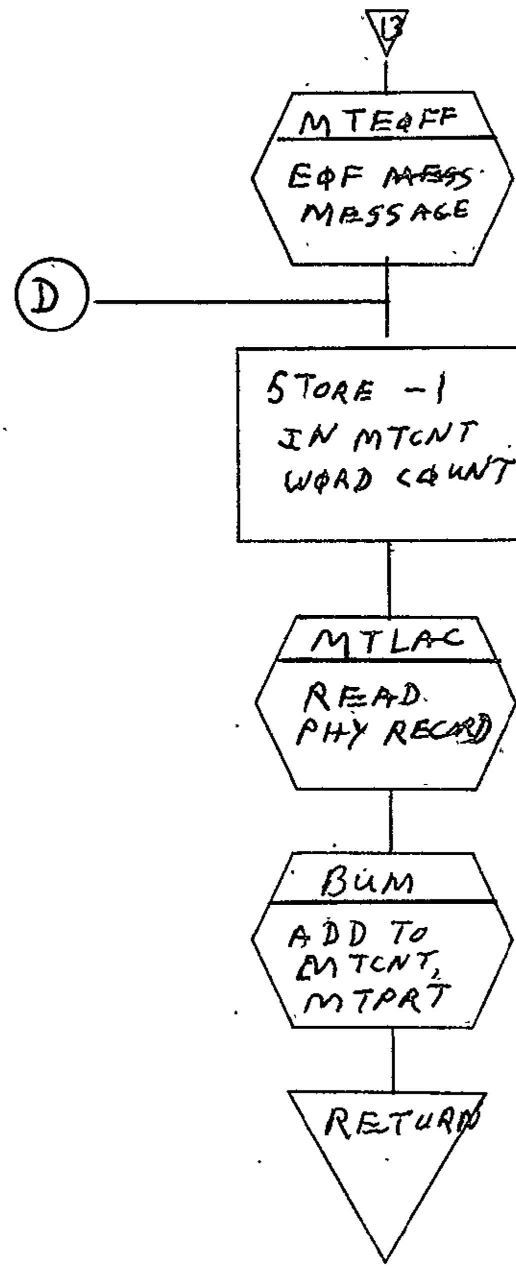

11
SET X COORD
60
LINES
N
A
Y
NEXPIC
ADVANCE
FRAME
3

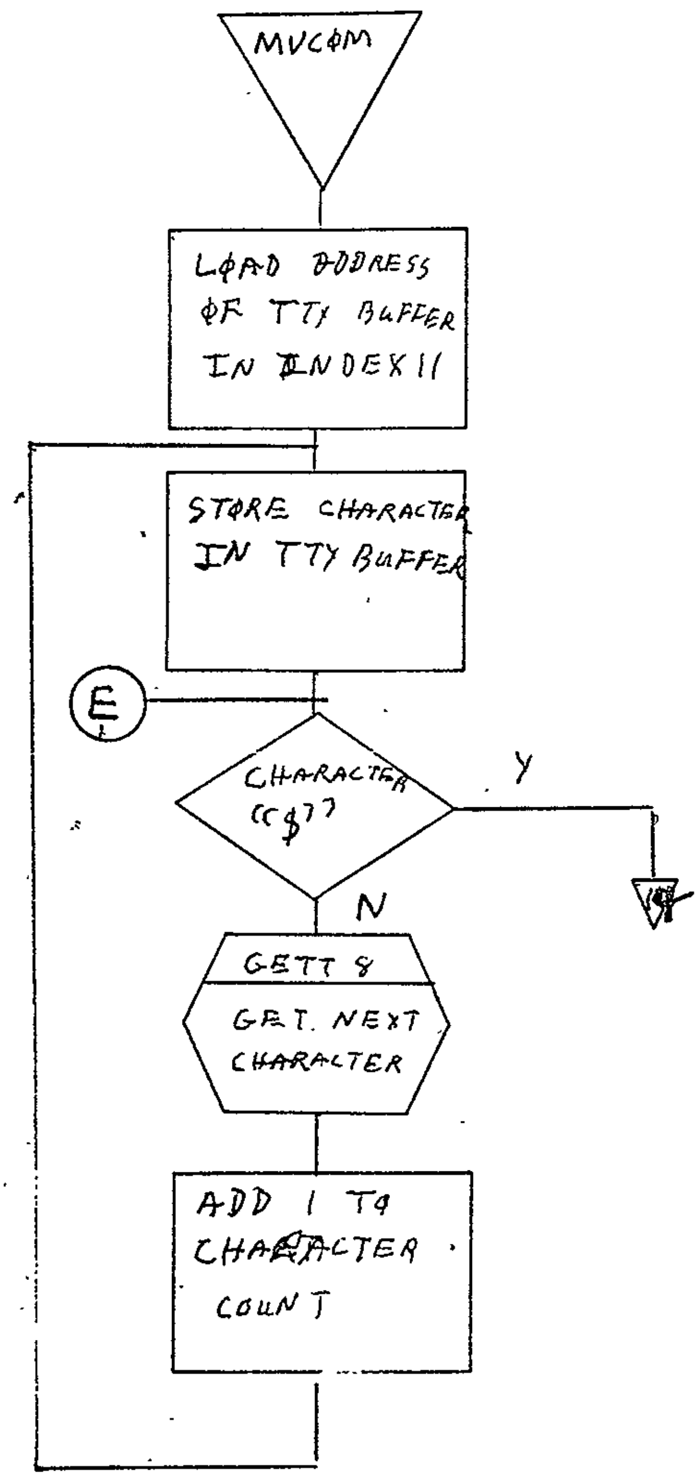

TREC
GETT8
GET 1ST CHARACTER FROM TAPE
COM CONTROL RECORD (D9)
N
Y
A
GETT8
GET 2ND CHARACTER FROM TAPE
(T)
Y
N
C
MONOUX
CONTROL ERROR
EXIT MONITOR

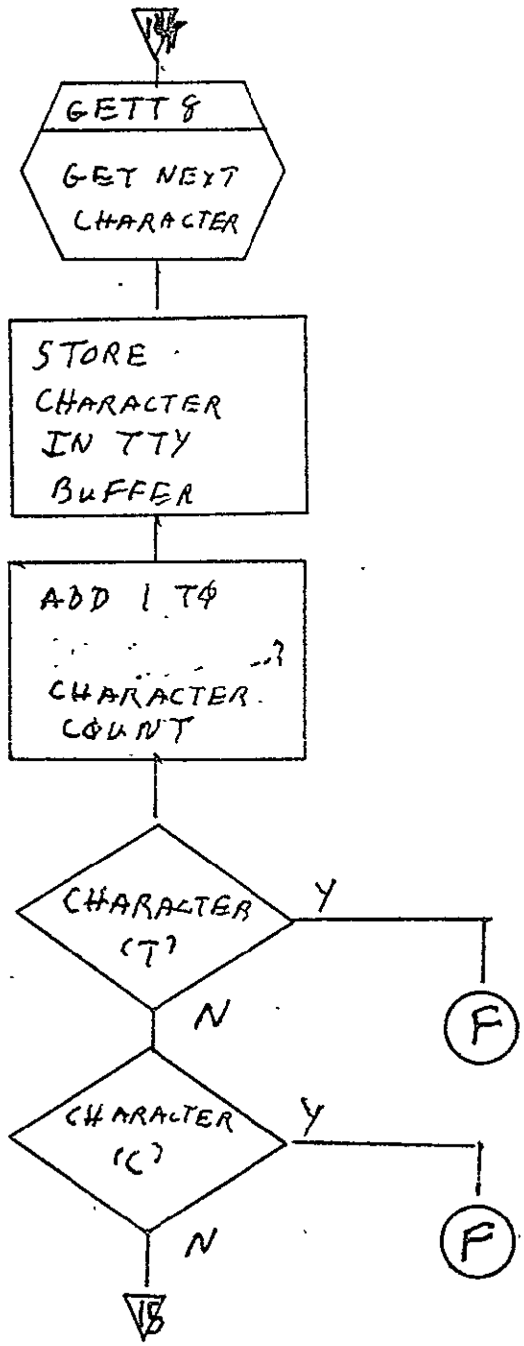

12
MVCOM
MOVE TITLE RECORD TO TITLE AREA
FICTAP
SET UP FICHE TITLE
RSRT
RESTORE READ PAR
BUM
SUBTRACT FORM READ PAR
DUMRD
READ NEXT LOG RECORD
RETURN

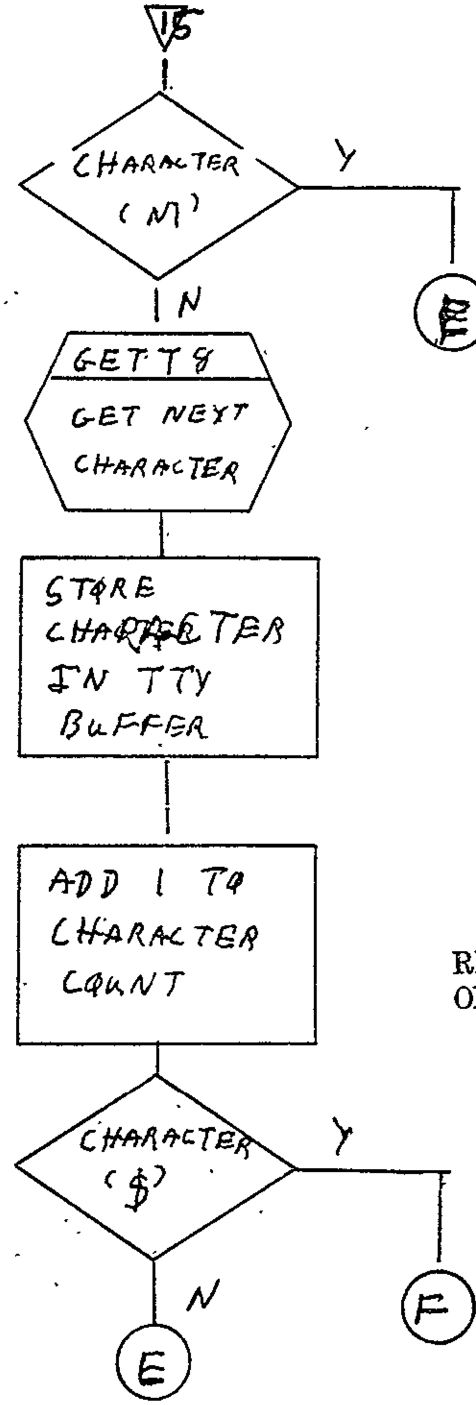

BUM
SUBTRACT 1 FROM MTPTR READ POINTER
SUBTRACT 1 FROM MTCNT READ WORD COUNT
RETURN

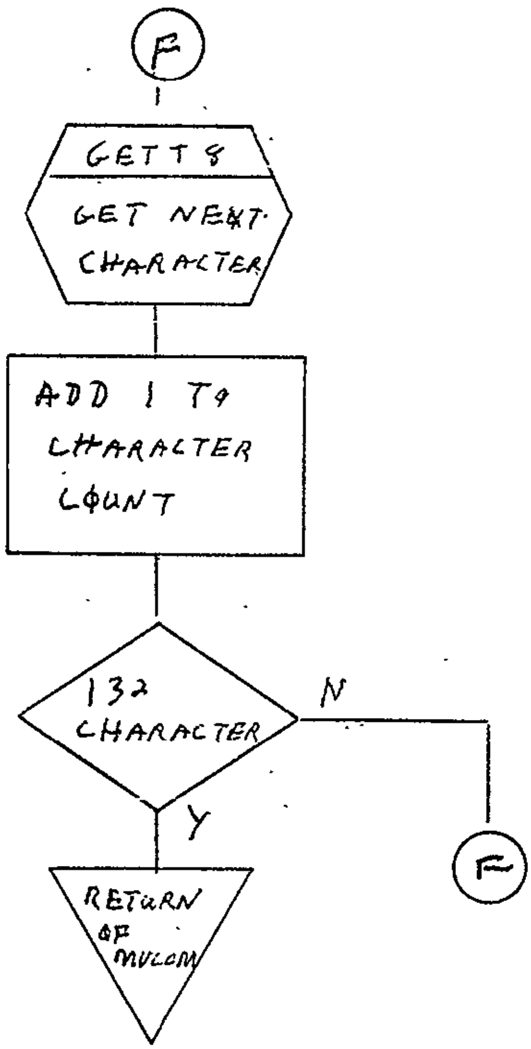

DUMRD
KYBLIS
KEYBOARD LISTEN
ADD 66 TO MTCNT WORD COUNT
MTCNT -1
Y
N
D
MTCNT ≥0
Y
N
ADD 66 TO MTPTR READ POINTER ZERO MTBYTC
RETURN

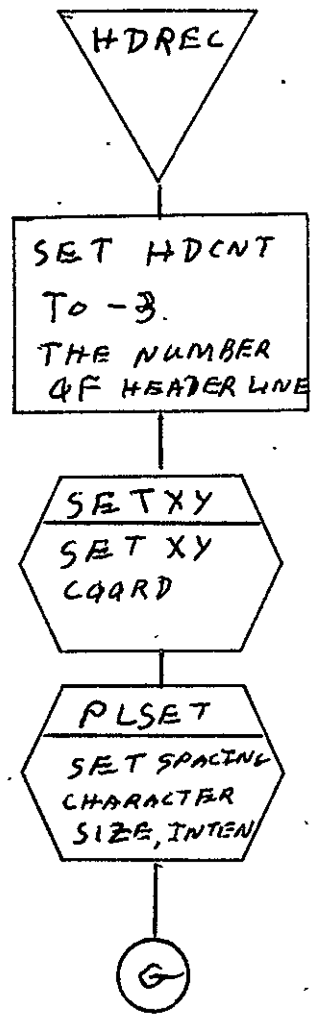

13
MTEØFF
EØF ~~MESS~~
MESSAGE
D
STORE -1
IN MTCNT
WØRD CØUNT
MTLAC
READ
PHY RECØRD
BUM
ADD TO
MTCNT,
MTPRT
RETURN

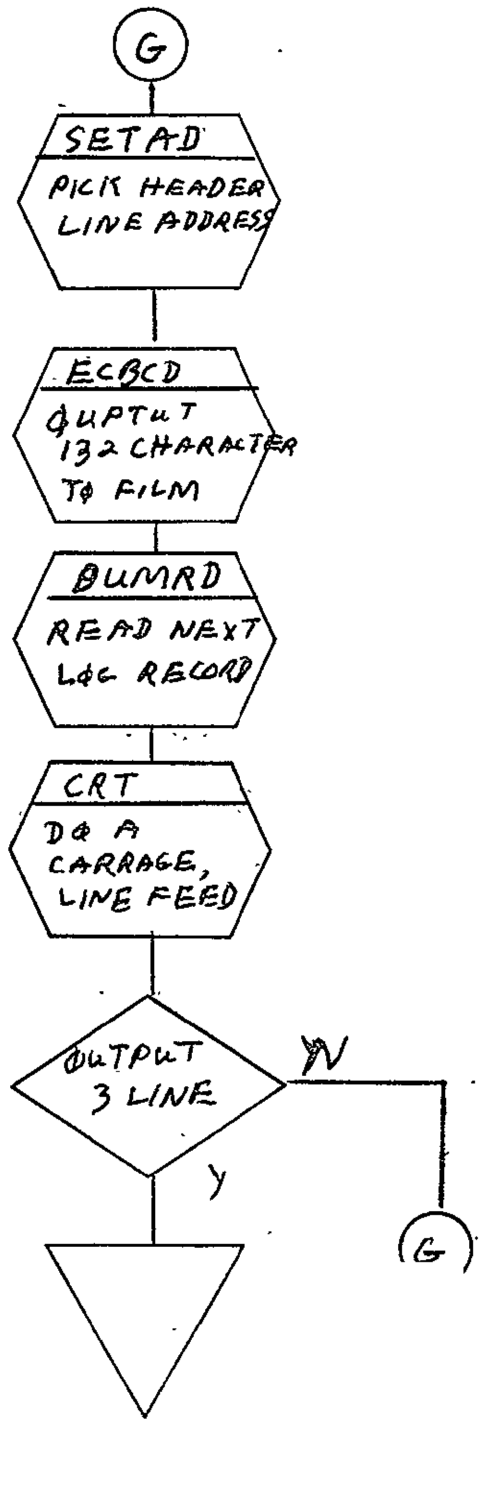

MVCØM
LØAD ADDRESS ØF TTY BUFFER IN INDEX 11
STØRE CHARACTER IN TTY BUFFER
E
CHARACTER (C$)?
Y
N
GETT 8
GET NEXT CHARACTER
ADD 1 TØ CHARACTER COUNT

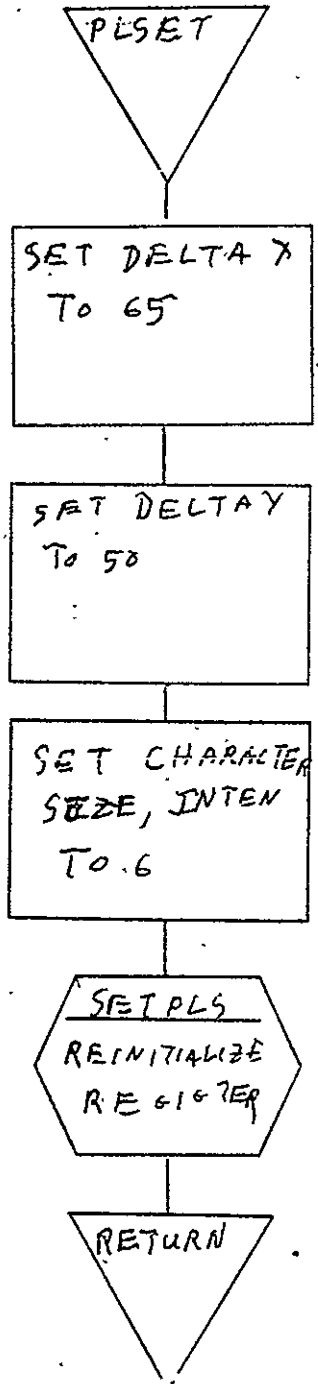

GETT8
GET NEXT CHARACTER
STORE CHARACTER IN TTY BUFFER
ADD 1 TO CHARACTER COUNT
CHARACTER (T?
Y
N
F
CHARACTER (C?
Y
N
F

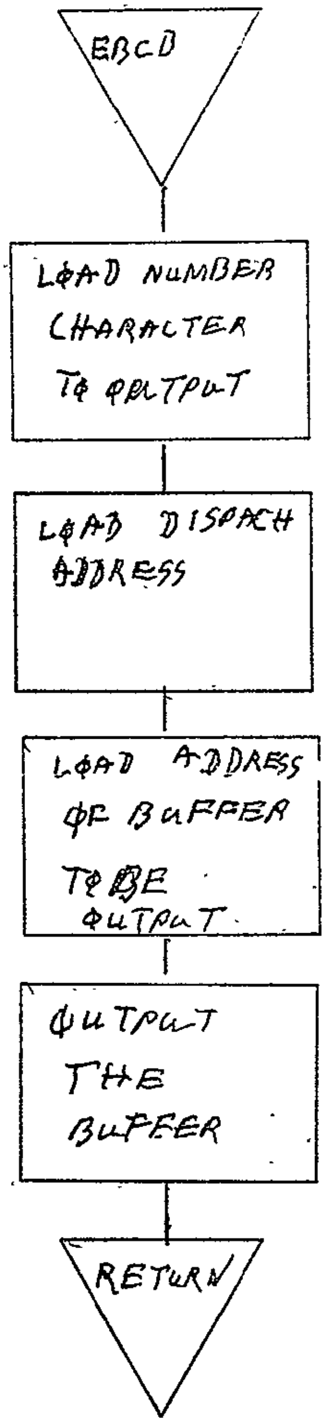

15
CHARACTER (M)
Y
N
E
GETT8
GET NEXT CHARACTER
STORE CHARACTER IN TTY BUFFER
ADD 1 TO CHARACTER COUNT
CHARACTER ($)
Y
N
E
F

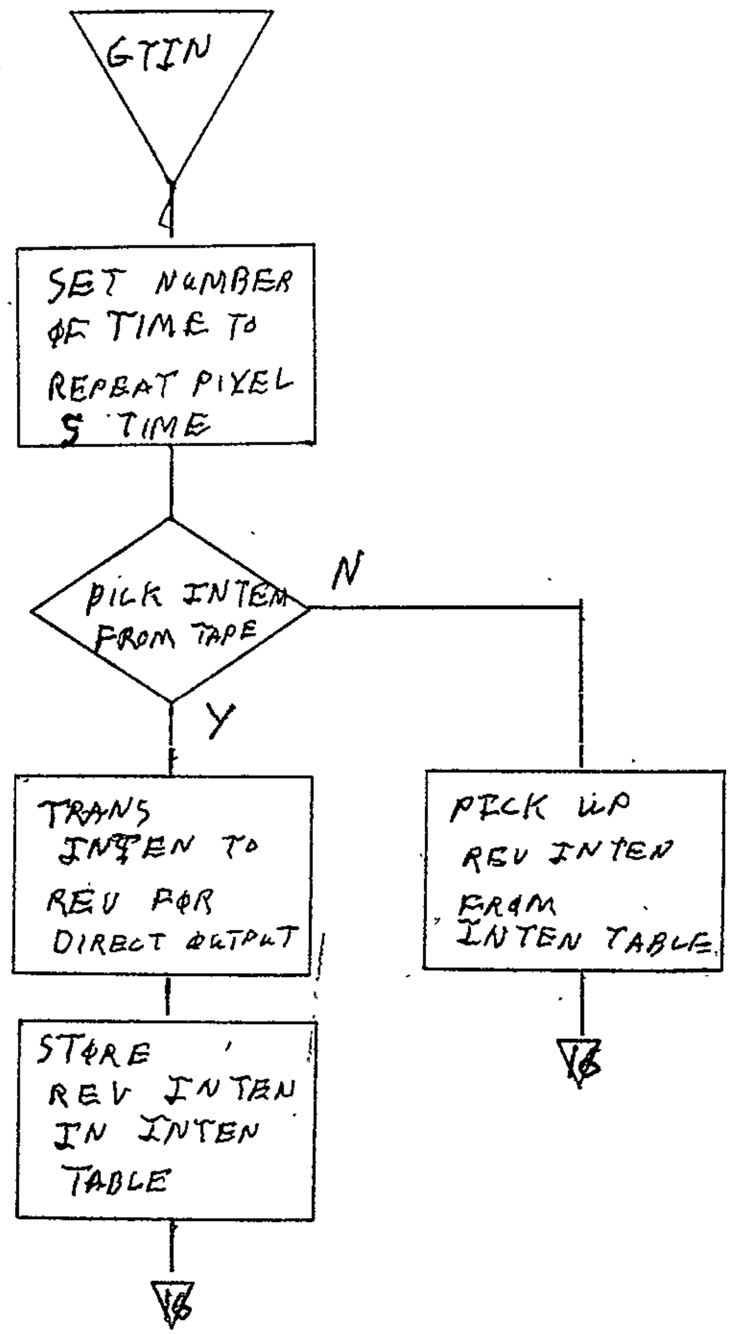

F
GETT8
GET NEXT
CHARACTER
ADD 1 TO
CHARACTER
COUNT
132
CHARACTER
N
Y
RETURN
OF
MVLCM
F

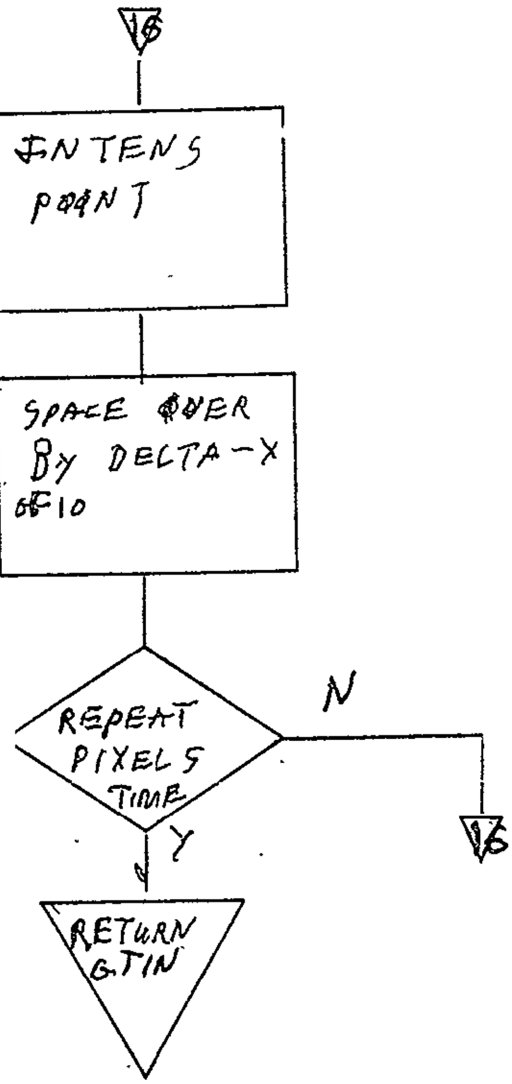

HDREC
SET HDCNT
To -3.
THE NUMBER
OF HEADER LINE
SETXY
SET XY
COORD
PLSET
SET SPACING
CHARACTER
SIZE, INTEN
G

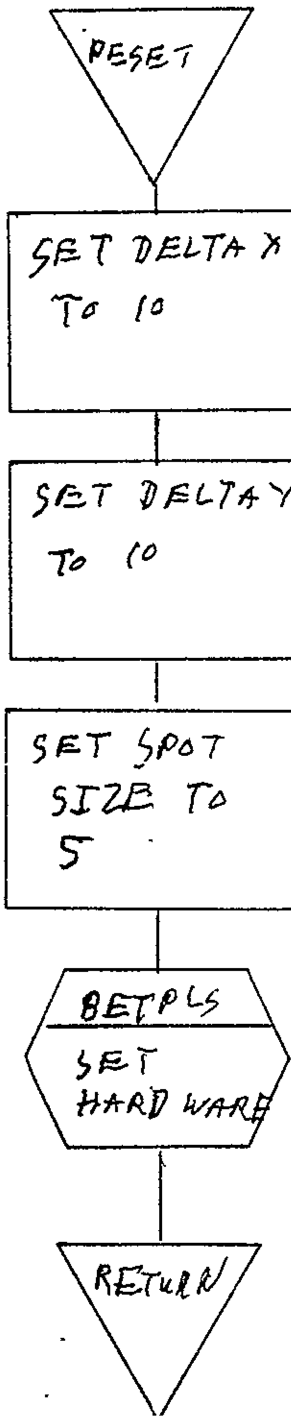

G
SETAD
PICK HEADER
LINE ADDRESS
ECBCD
OUTPUT
132 CHARACTER
TO FILM
DUMRD
READ NEXT
LOG RECORD
CRT
DO A
CARRAGE,
LINE FEED
OUTPUT
3 LINE
N
Y
G

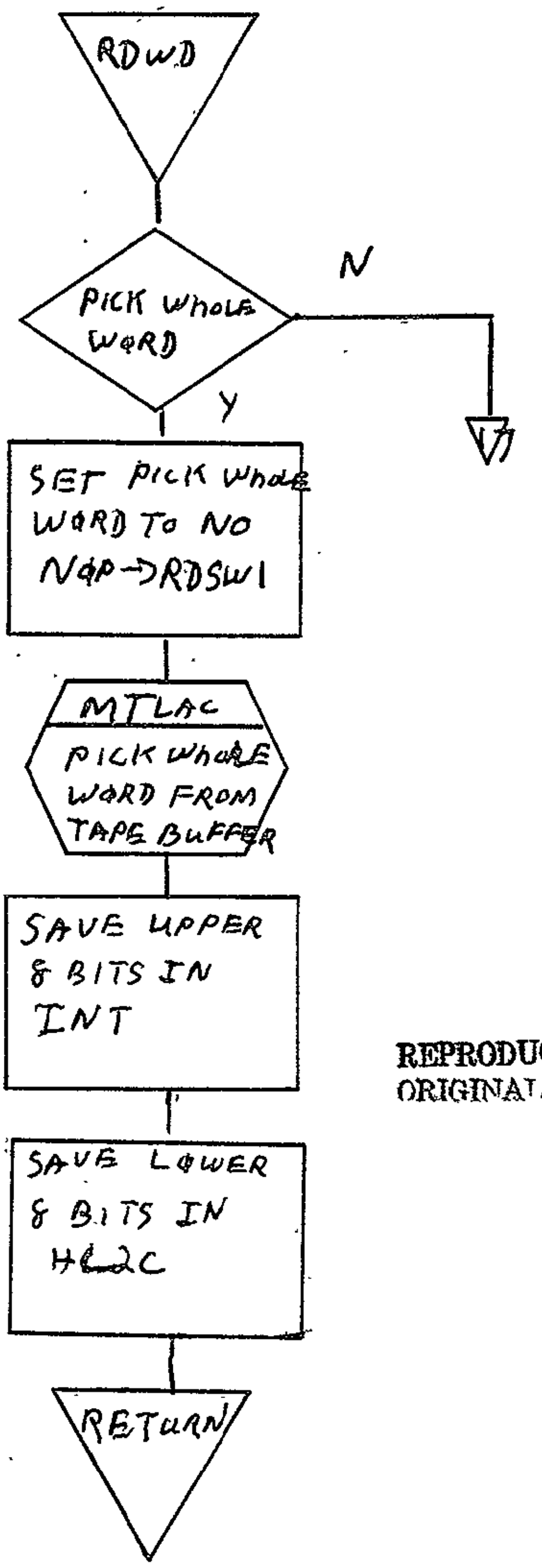

PLSET
SET DELTA X
TO 65
SET DELTAY
TO 50
SET CHARACTER
SIZE, INTEN
TO 6
SETPLS
REINITIALIZE
REGISTER
RETURN

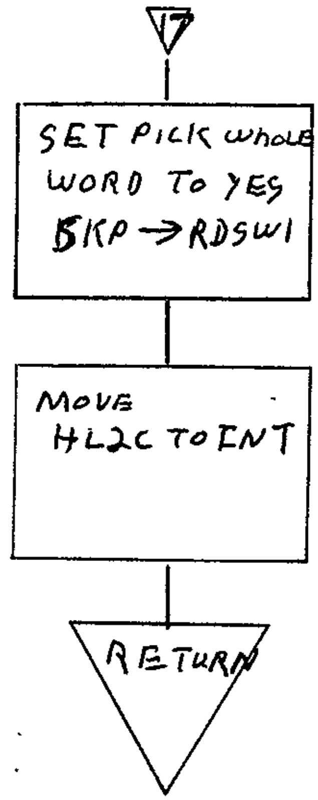

EBCD
LOAD NUMBER CHARACTER TO OUTPUT
LOAD DISPACH ADDRESS
LOAD ADDRESS OF BUFFER TO BE OUTPUT
OUTPUT THE BUFFER
RETURN

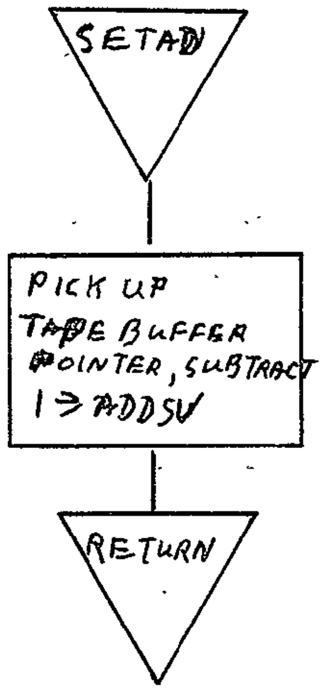

GTIN
SET NUMBER OF TIME TO REPEAT PIXEL 5 TIME
PICK INTEN FROM TAPE
N
Y
TRANS INTEN TO REV FOR DIRECT OUTPUT
STORE REV INTEN IN INTEN TABLE
PICK UP REV INTEN FROM INTEN TABLE
16
16

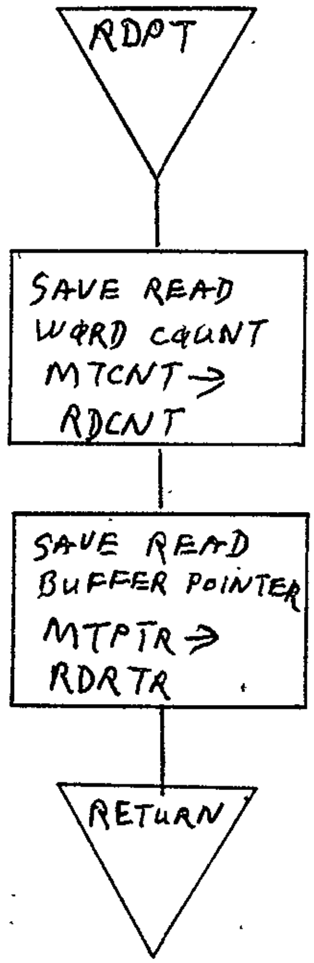

16
INTENS
POINT
SPACE OVER
BY DELTA-X
OF 10
REPEAT
PIXELS
TIME
N
Y
16
RETURN
GTIN

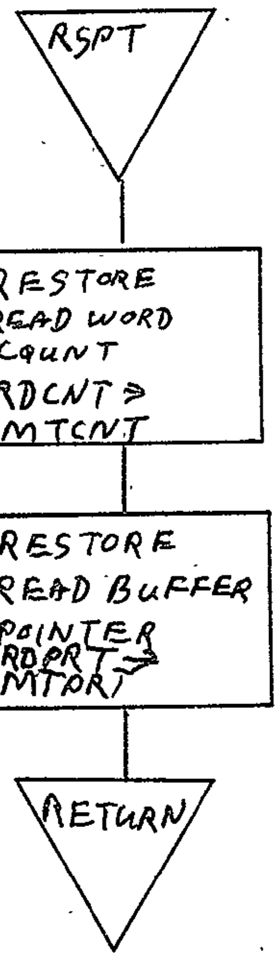

RESET
SET DELTA X TO 10
SET DELTA Y TO 10
SET SPOT SIZE TO 5
BETPLS
SET HARDWARE
RETURN


RDWD
PICK WHOLE WORD
N
Y
SET PICK WHOLE WORD TO NO
NOP→RDSW1
MTLAC
PICK WHOLE WORD FROM TAPE BUFFER
SAVE UPPER 8 BITS IN INT
SAVE LOWER 8 BITS IN HL2C
RETURN


17
SET PICK WHOLE WORD TO YES
5KP → RDSWI
MOVE HL2C TO INT
RETURN


SETAD
PICK UP TAPE BUFFER POINTER, SUBTRACT 1 ⇒ ADDSV
RETURN


RDPT
SAVE READ
WORD COUNT
MTCNT →
RDCNT
SAVE READ
BUFFER POINTER
MTPTR →
RDRTR
RETURN


RSPT
RESTORE
READ WORD
COUNT
RDCNT ⇒
MTCNT
RESTORE
READ BUFFER
POINTER
RDPRT ⇒
MTPRT
RETURN

2.9 COMA IBM SYSOUT PRINT PROCESSOR (105PR, 16PRNT)

2.9.1 Background

A. Author. Information International Inc., 12435 West Olympic Boulevard, Los Angeles, California, 90064.

Intent. The IBM Sysout Print Processor processes magnetic tapes from the IBM 360/75's. 105PR is requested when 105 mm fiche is desired, and 16PRNT is requested when 16 mm film is desired.

Program History

1. Production Tape Date. 14 January 1975.
2. Author. I.I.I.
3. Authorization. EO-005F
4. Test Cases. AT procedures SB-09613A.
5. Revisions. Reference Appendix B, paragraph B.9.

2.9.2 Introduction.

This paragraph describes the usage and design of the Informational International IBM Sysout Print Processor Program. MONITOR and associated I/O driver routines are described in TR531, Vol. I.

2.9.2.1 Hardware Requirements

- FR80 with 12K memory
- 9-track tape unit
- 16 mm or 105 mm camera.

2.9.2.2 Software Requirements

III109	III166 ADVAN	III164
III166	III166 TABLE	III164 FILM
III166 INVAR	III161	III186
III161 GO	III185	III187
III147	III162 MACRO	PRINTF COM
III162	III163	FLOAD

2.9.2.3 Assembly Parameters. The insert file III109 contains the standard assembly parameters for machine and camera configuration. Specific assembly parameters for the IBM Sysout Print Processor are as follows.

A. EBCDIC. Defines the EBCDIC character set.

B. LOCASE. Includes the lower case characters in the character set.

C. TAPELB. Defines code to provide automatic processing of standard labeled tapes.

D. ALLOW. Defines code to allow form loading and flashing.

2.9.2.4 Operator Commands. The following commands are available for operator use.

*TIME

*FRAME=0

*GO

*CONTINUE

*END JOB

*MAKE FILM=L

*CLEAR

*ADVANCE

*REWIND

*SKIP

*TRY AGAIN

*STANDARD LABELS

*UNLABELLED

*FORM

*INDEX FORM

*ERROR FORM

*ROTATION=0

2.9.3 Analysis

2.9.3.1 Major Control Section

A. Description. From location BEGIN, PINIT is called to initialize the PLS and to set character size, rotation, and deltas. If the tape is labeled, LBDATA is called to process the tape label. MTINIT is then called to initialize the magnetic tape routines, allocate the buffer areas, and read the first two records on the tape. Various program parameters are initialized (housekeeping) and NEXPAG is called to force a page eject. Control then goes to GETLNI, where magnetic tape records are checked to assure that they are larger than two bytes. Smaller records are ignored. If the record size is longer than two bytes, the line length is calculated from the data, and PRSETX is called to set the X DAC. If there are no carriage controls, the program jumps to GETLN4, which sets up for the print loop. Otherwise, the carriage controls are interpreted by GETHCD and GETLN5. SKTOCH is called to process the carriage control or page eject and control goes to GETLN4 to set up for the print loop. The print loop has three entrances, and the one used is determined by the byte position of the first character to be printed. If there are any characters to be printed, control then goes to the print loop; if not, the next line is processed. The print loop prints the entire line with the high-speed character generator, unless it has to check for a logical record mark, in which case it must print a character at a time. The print loop exits when the character count is exhausted or a record mark is encountered. Control then goes to GETLIN. Time is given here to read from magnetic tape, and any fiche control records or indexing records are processed. PKYBLS is called to check for an operator interrupt, and control goes to GETLNI. The program continues processing, one line at a time, until an end-of-file mark is encountered. At this point processing is terminated and control is returned to the teletype monitor.

B. Input/Output. Operator input and output is through the teletype. Data input is via 9-track magnetic tape, and output is on 16 mm or 105 mm film.

C. Linkages

1. External

Routine	Program	Calling Sequence
PINIT	III166	JMS PINIT
MDOUT	III166	JMS MDOUT
MONANT	III166	JMS MONANT
ACCTG	III166	JMS ACCTG
ADVANN	III166 ADVAN	ADVANN
MTTOUT	III166	JMS MTTOUT
MCRLF	III166	JMS MCRLF
NEXPIC	III166 ADVAN	NEXPIC
KYBLIS	III166	JMS KYBLIS
FICTAP	III166	JMS FICTAP
MOOVT	III166	JMS MOOVT
MMASSG	III166	JMS MMASSG
DRWVEC	III162	JMS DRWVEC
SETXYS	III166	JMS SETXYS
SETTLS	III162	JMS SETTLS
MVDATA	III166	JMS MVDATA
MNLSIZ	III166	MNLSIZ
FRSPIC	III166 ADVAN	FRSPIC
FLASH	III187	FLASH
MONAUT	III166	JMP MONAUT
HDRTRL	III166	JMS HDRTRL
FCFIN	III166 ADVAN	FCFIN
FC7CLR	III166 ADVAN	FC7CLR

2. Internal

Routine	Calling Sequence
LBDATA	JMS LBDATA
FINDCH	JMS FINDCH
SKTOCH	JMS SKTOCH
TYPLIN	JMS TYPLIN
PRLNFD	JMS PRLNFD
PRSETX	JMS PRSETX
PRLNFS	JMS PRLNFS
NEXPOK	NEXPOK
NEXPAG	NEXPAG
TOPPAG	TOPPAG

Routine	Calling Sequence
SETCHG	JMS SETCHG
PPAGE	PPAGE
PFLASH	PFLASH
PKYBLS	JMS PKYBLS
FCPROC	JMS FCPROC
FCAAAF	JMS FCAAAF
INXSET	JMS INXSET
MTINIT	JMS MTINIT
GETREC	JMS GETREC
GETEND	JMS GETEND
POKEMT	JMS POKEMT
POKAGN	JMS POKAGN
POKEMS	JMS POKEMS
CUTMAK	JMS CUTMAK

2.9.3.2 Subroutines

A. LBDATA. Processes tape labels. If the tape is labeled, the logical record size, carriage controls, blocking factor, and blocking type will be set.

B. SKTOCH. Does the hardware carriage control processing; either skips to the appropriate line number or ejects the appropriate number of linefeeds. Only skips to channel 1 are processed as page ejects; all others are linefeeds. If CHANUM is negative, SKTOCH ejects the 1's compliment of linefeeds. If CHANUM is positive, the channel skip takes place.

C. TYPLIN. Types characters to the teletype.

D. PRLNFD. Does one, two, or three linefeeds, according to the value of NUMSPC. NUMSPC can specify single, double, or triple linefeed. PRNLFD calls PRLNFS.

E. PRLNFS. Does one linefeed and a page eject if at a page boundry.

F. PRSETX. Sets the X DAC (X position) to the left margin on the screen.

G. FINDCH. Updates the pointers to the next magnetic tape buffer. At exit, LWDTMP points to the current word, and LCHTMP points to the current byte position in the word.

H. NEXPOK. Calls NEXPAG to advance the camera and flash the forms, if any.

I. NEXPAG. Calls PPAGE to flash any requested forms, calls NEXPIC to advance the camera, and calls TOPPAG to reset the DAC's (beam position) to the top of page.

J. TOPPAG. Flashes cutmark if 16 mm, resets print line number, restores the page line count, and sets the DAC's to top of page.

K. SETCHG. Prints characters found in the AC and loads the base address for the high-speed chatacter generator.

L. PPAGE. Calls PFLASH to flash the null and any requested forms if the current page is not blank.

M. PFLASH. Calls FLASH to flash forms; if form is not loaded, outputs error message.

N. PKYBLS. Calls KYBLIS to check for input from operator.

O. FCPROC. Is called if title record is found. FCPROC stores the fiche control line in the teletype buffer and calls NEXPAG before printing the next line.

P. FCAAAF. For 105 mm only, prints the index line and stores the data for the index frame.

Q. INXSET. For 105 mm only, sets up for the index data to be fetched and stored at the end of the current line.

R. CUTMAK. For 16 mm only, puts the cutmark on 16 mm film.

S. MTINIT. Initializes the magnetic tape buffers, reads the first record off of tape and sets data ready, and starts a read of the second record before exit.

T. GETREC. Updates the buffer pointers and calls POKEMT to read another record.

U. GETEND. Finds the last word in the most recent record read from tape.

V. POKEMT. Calls POKEMS to read a record off of tape if there is an empty buffer and checks for an end-of-file. If an error has occurred, the record is reread.

W. POKAGN. Backspaces the tape one record for a retry if an error occurred on read.

X. POKEMS. Reads one record off tape. POKEMS is called by POKEMT.

2.9.3.3 Constants and Variables

A. AUXCNT. Auxiliary control table. Any control that is unknown to the program is stored here.

B. CHANUM. Contains the space count if negative. If positive contains the channel number or form number.

C. CHARCT. Contains the negative character per line count used in the print loop.

D. HSLBPW. Contains starting address of the Character Dispatch Table. Used as a base address for the high-speed character generator.

E. LCHPTR. Points to the current byte in the magnetic tape buffer. Initialized to zero after each read.

F. LWDPTR. Points to first word of magnetic tape data.

G. LWDTMP. Points to current word in tape buffer

H. NFRMNM. Contains current form number.

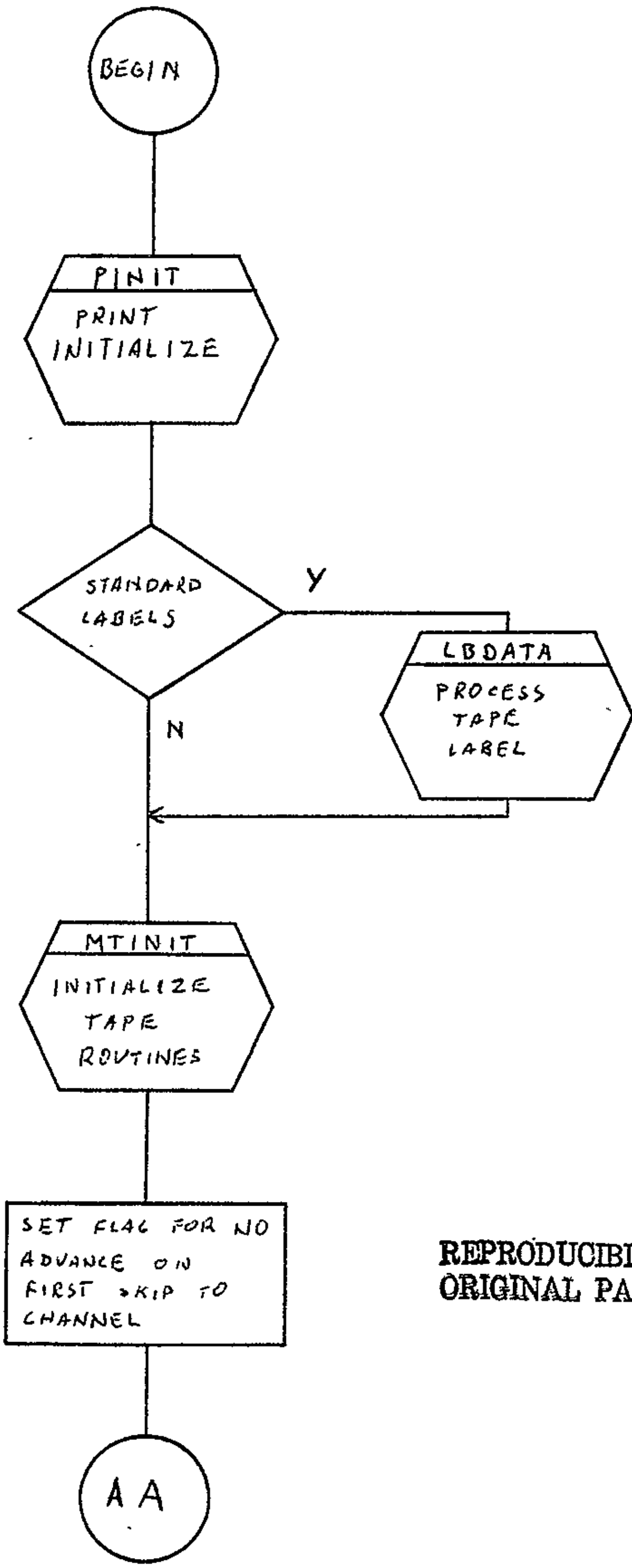
I. NUMSPC. Specifies single, double or triple linefeed mode.

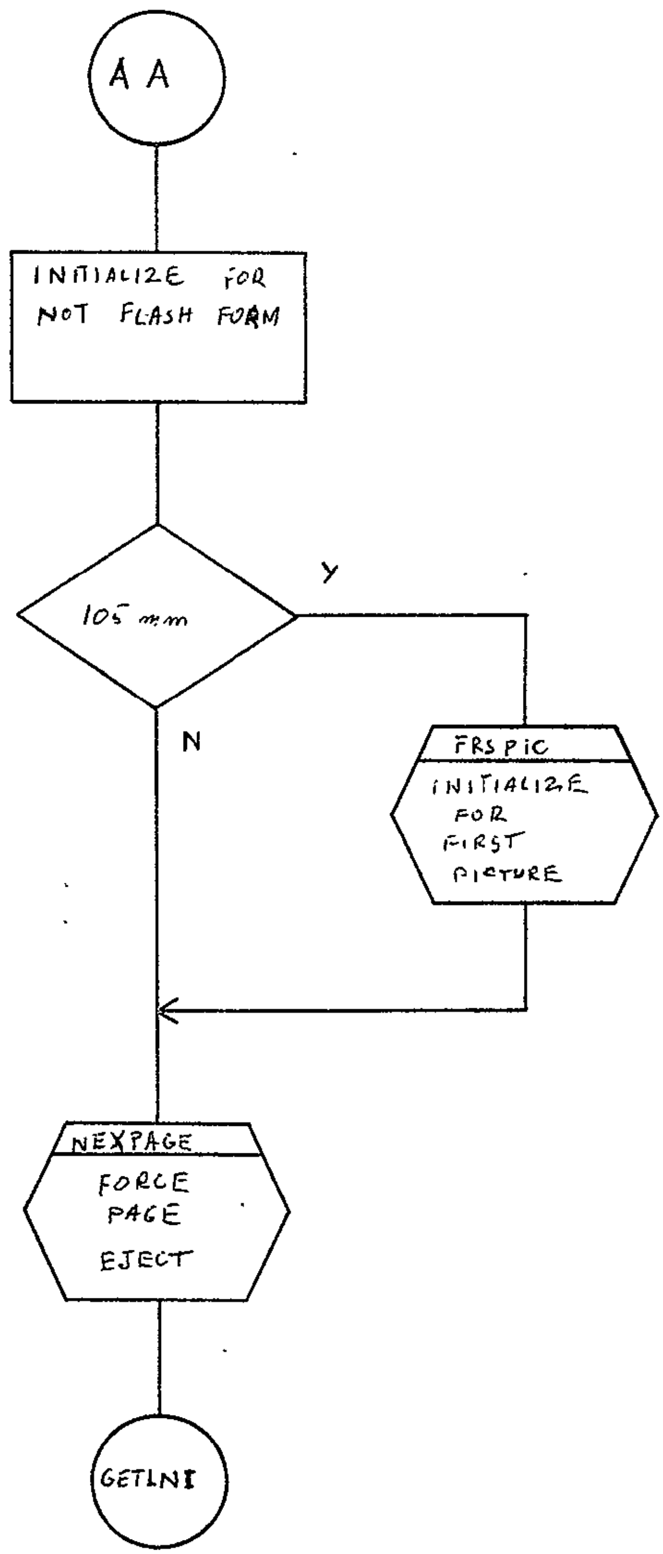
J. PAGCNT. Contains the current page count.

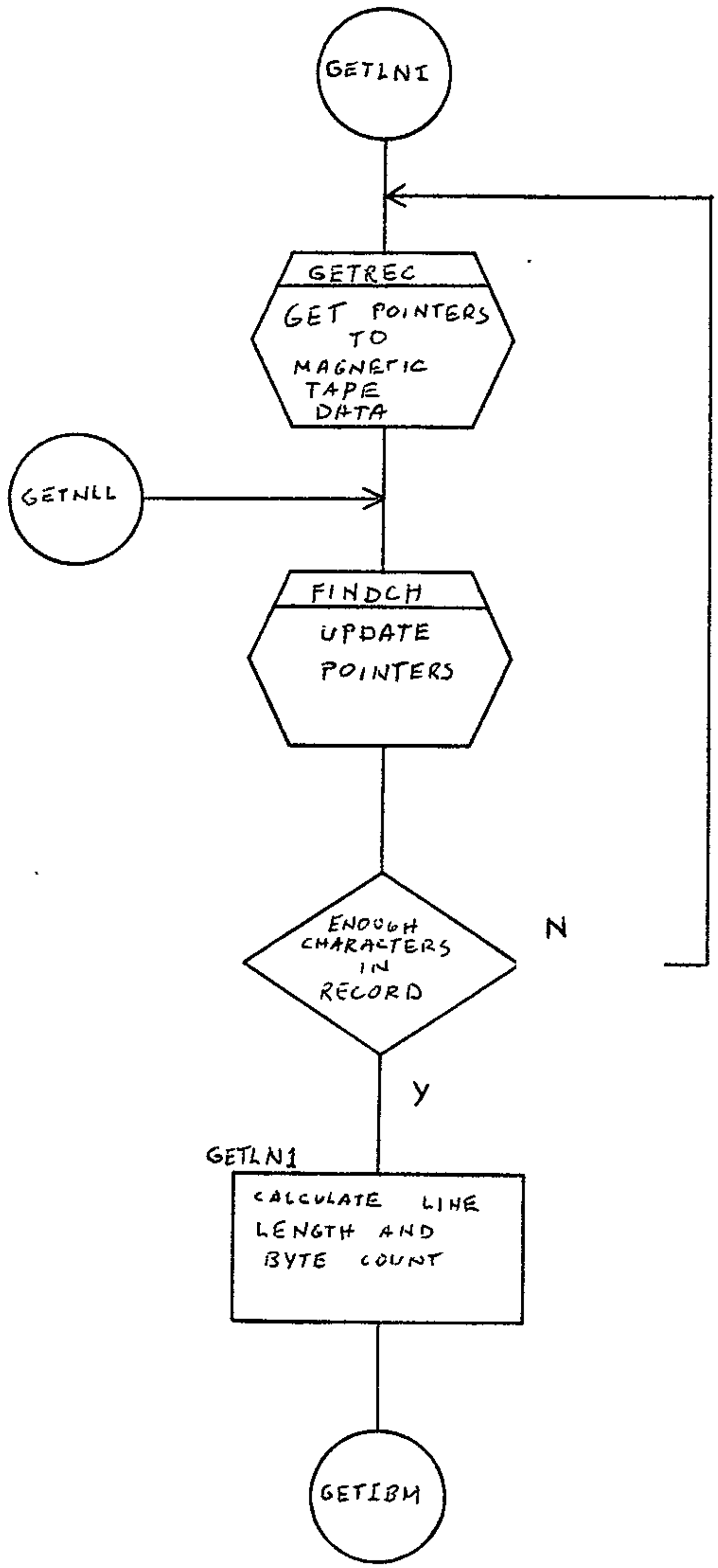
K. PLINUM. Contains the current print line number

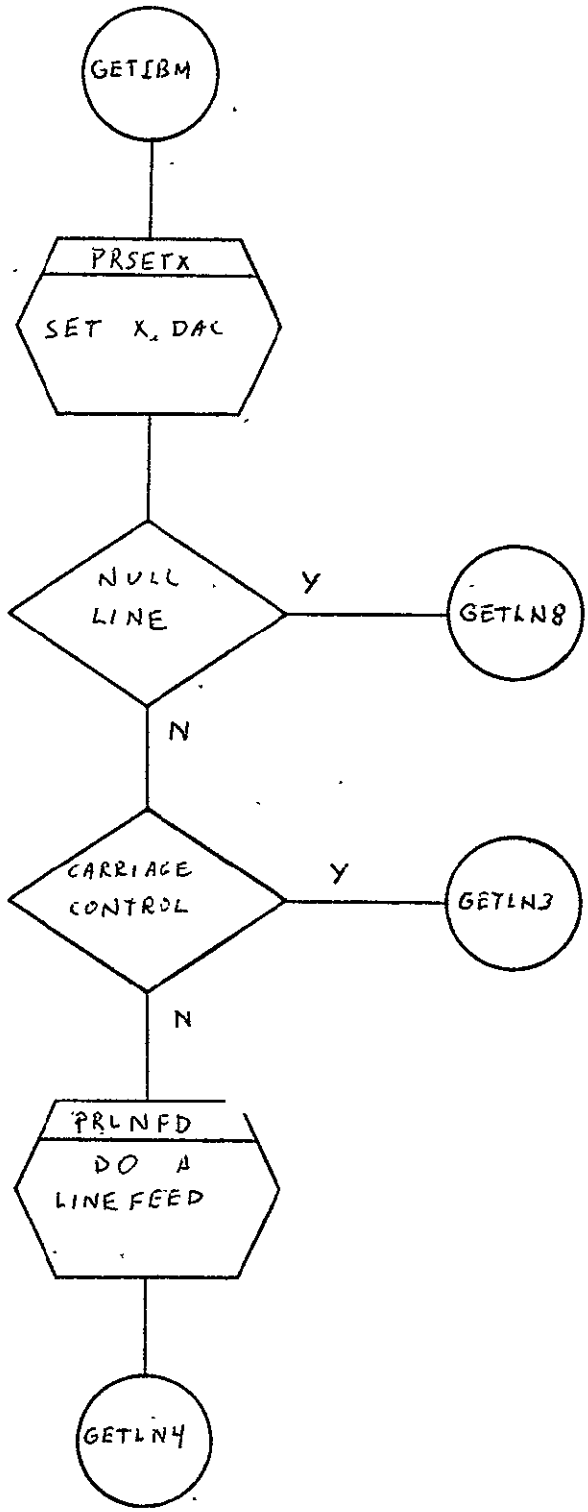
L. VBSIZ. Contains the magnetic tape record size in words.

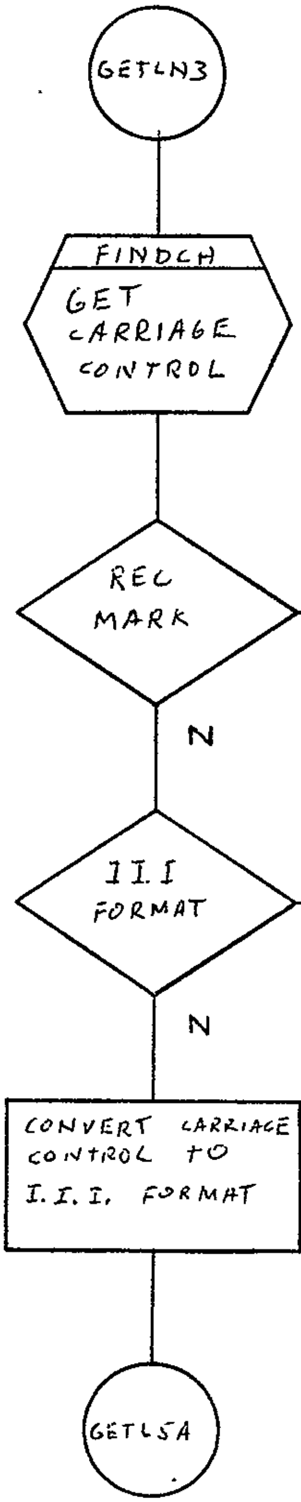
2.9.3.4 Flow Charts. See following pages.

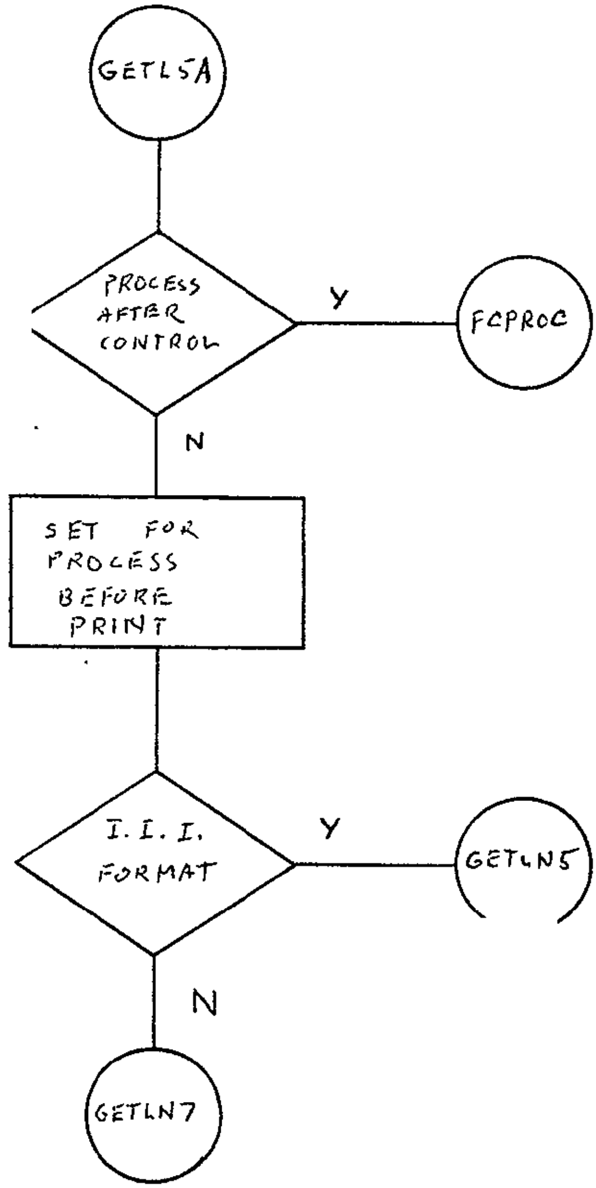

BEGIN
PINIT
PRINT INITIALIZE
STANDARD LABELS
Y
LBDATA
PROCESS TAPE LABEL
N
MTINIT
INITIALIZE TAPE ROUTINES
SET FLAG FOR NO ADVANCE ON FIRST SKIP TO CHANNEL
AA

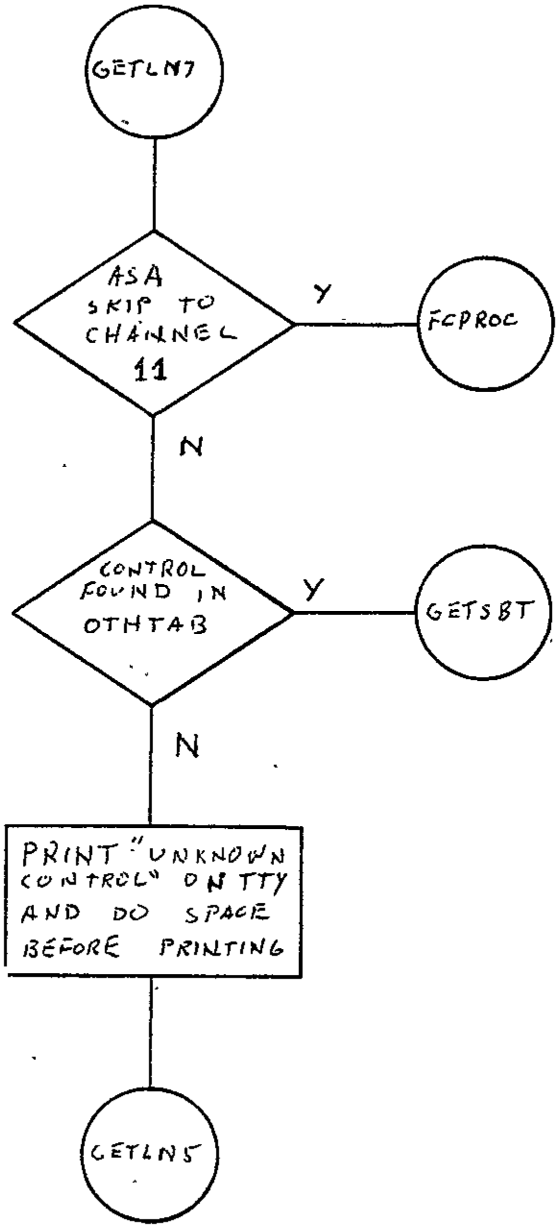

AA
INITIALIZE FOR NOT FLASH FORM
105 mm
Y
N
FRSPIC
INITIALIZE FOR FIRST PICTURE
NEXPAGE
FORCE PAGE EJECT
GETLNI

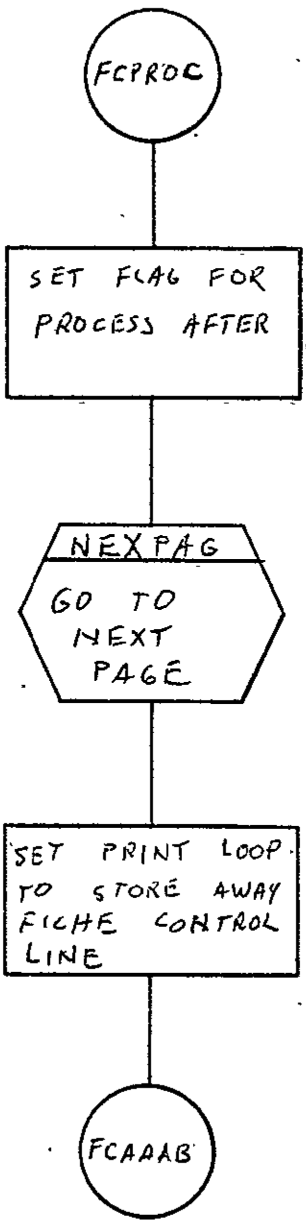

GETLNI
GETREC
GET POINTERS TO MAGNETIC TAPE DATA
GETNLL
FINDCH
UPDATE POINTERS
ENOUGH CHARACTERS IN RECORD
N
Y
GETLN1
CALCULATE LINE LENGTH AND BYTE COUNT
GETIBM

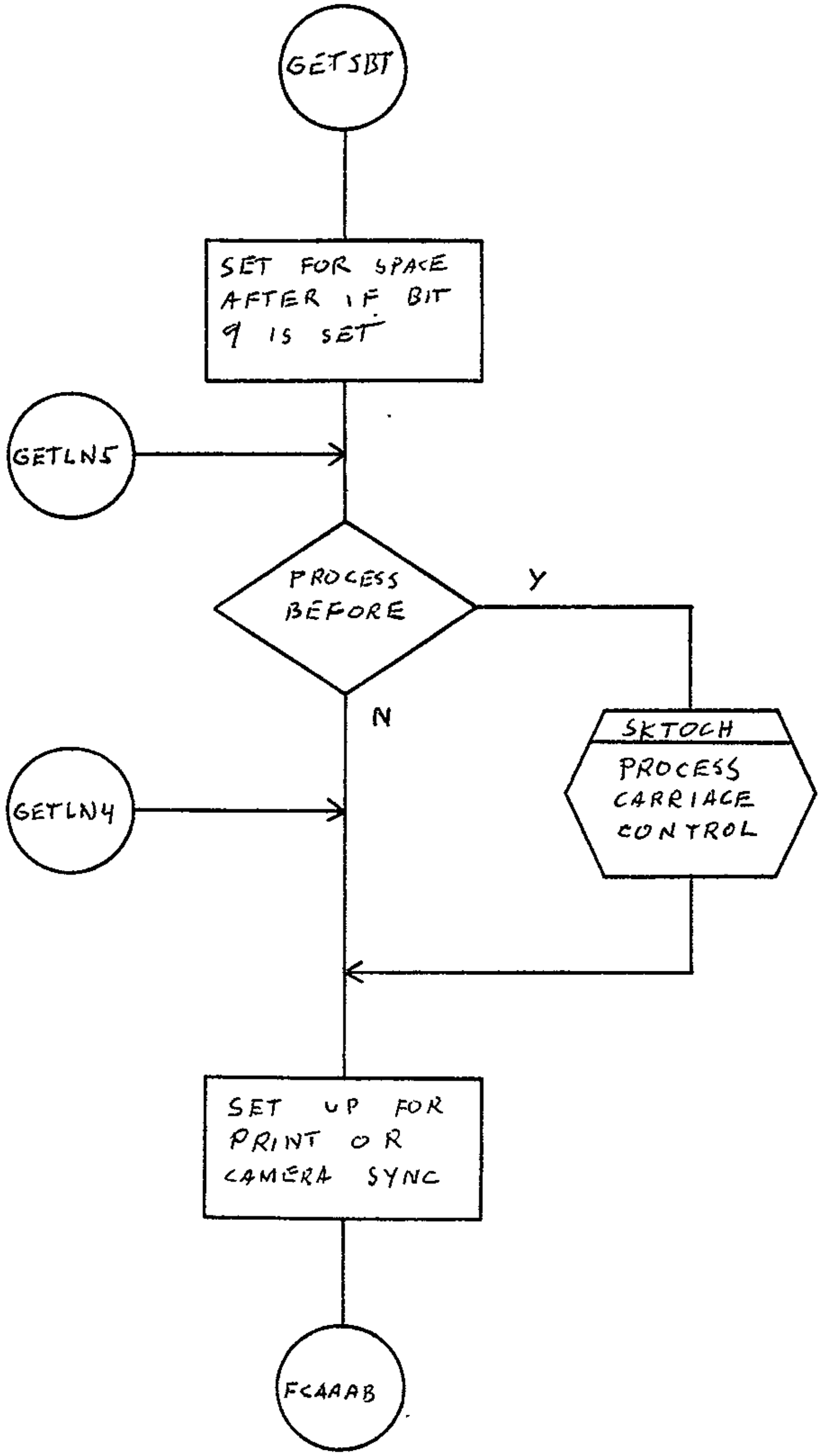

GETIBM
PRSETX
SET X, DAC
NULL LINE
Y
GETLN8
N
CARRIAGE CONTROL
Y
GETLN3
N
PRLNFD
DO A LINE FEED
GETLN4

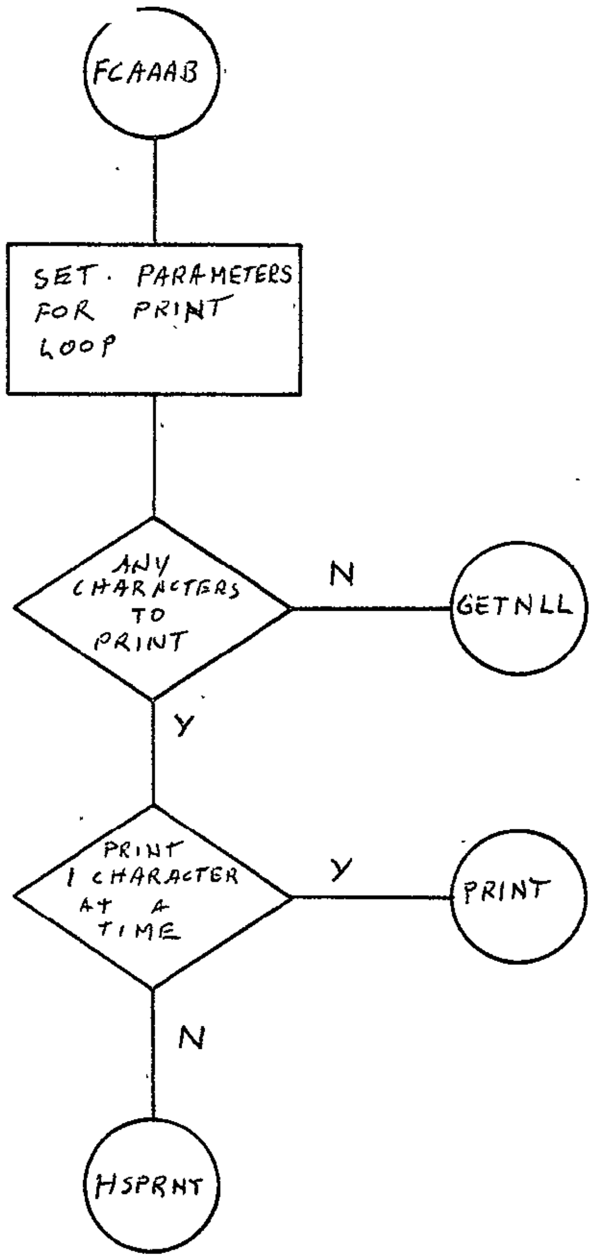

GETLN3
FINDCH
GET CARRIAGE CONTROL
REC MARK
Y
GETNLL
N
III FORMAT
Y
GETL5A
N
CONVERT CARRIAGE CONTROL TO I.I.I. FORMAT
GETL5A

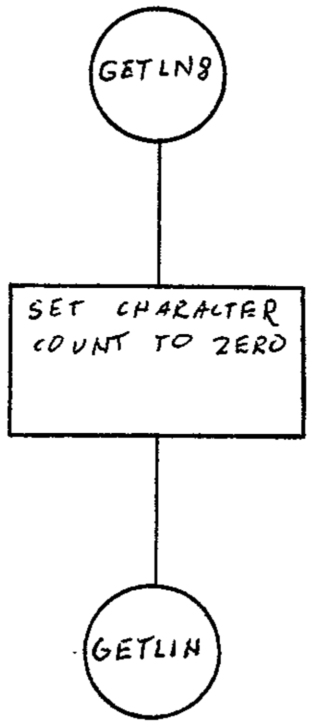

GETL5A
PROCESS AFTER CONTROL
Y
FCPROC
N
SET FOR PROCESS BEFORE PRINT
I.I.I. FORMAT
Y
GETLN5
N
GETLN7

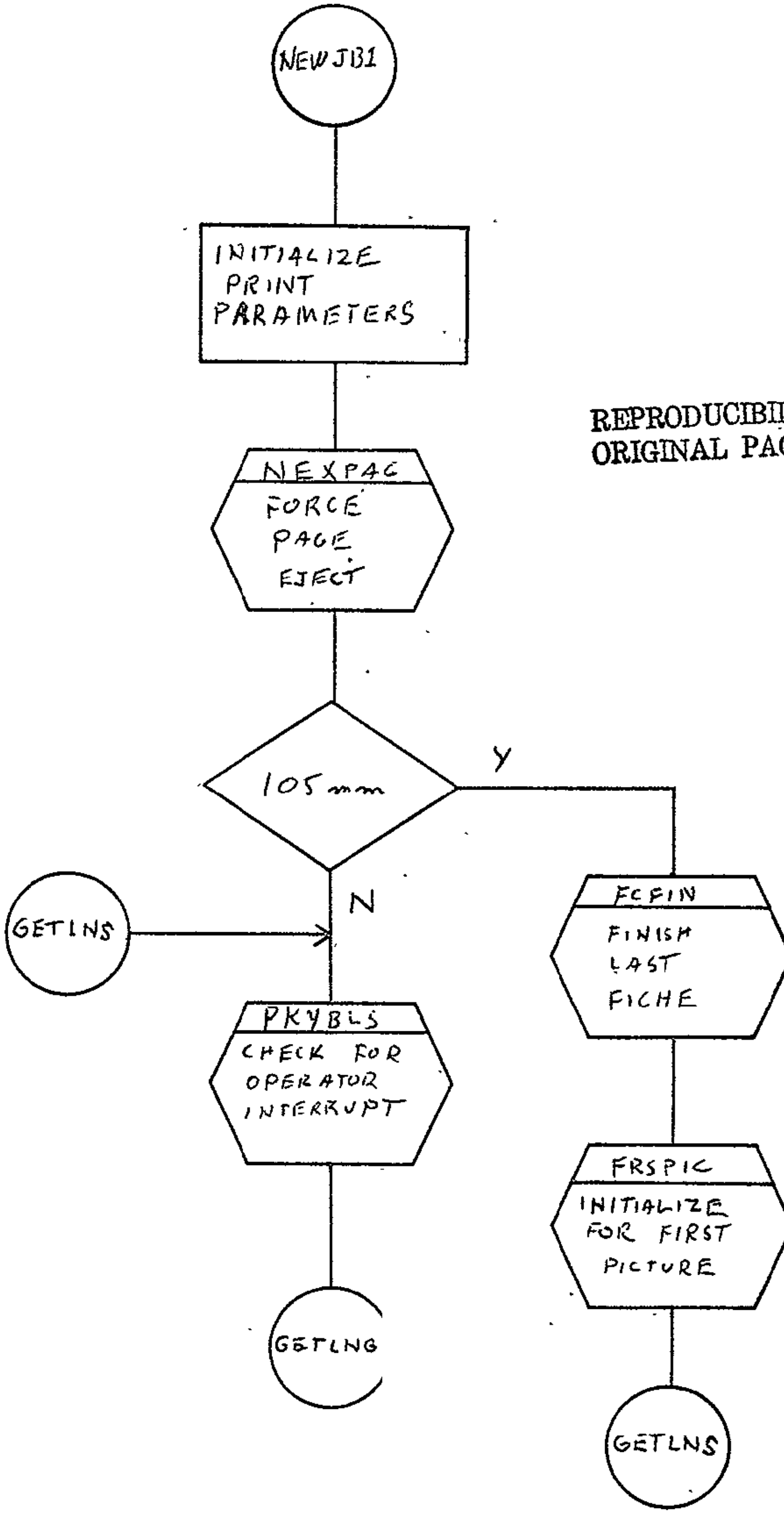

GETLN7
ASA SKIP TO CHANNEL 11
Y
FCPROC
N
CONTROL FOUND IN OTHTAB
Y
GETSBT
N
PRINT "UNKNOWN CONTROL" ON TTY AND DO SPACE BEFORE PRINTING
GETLN5

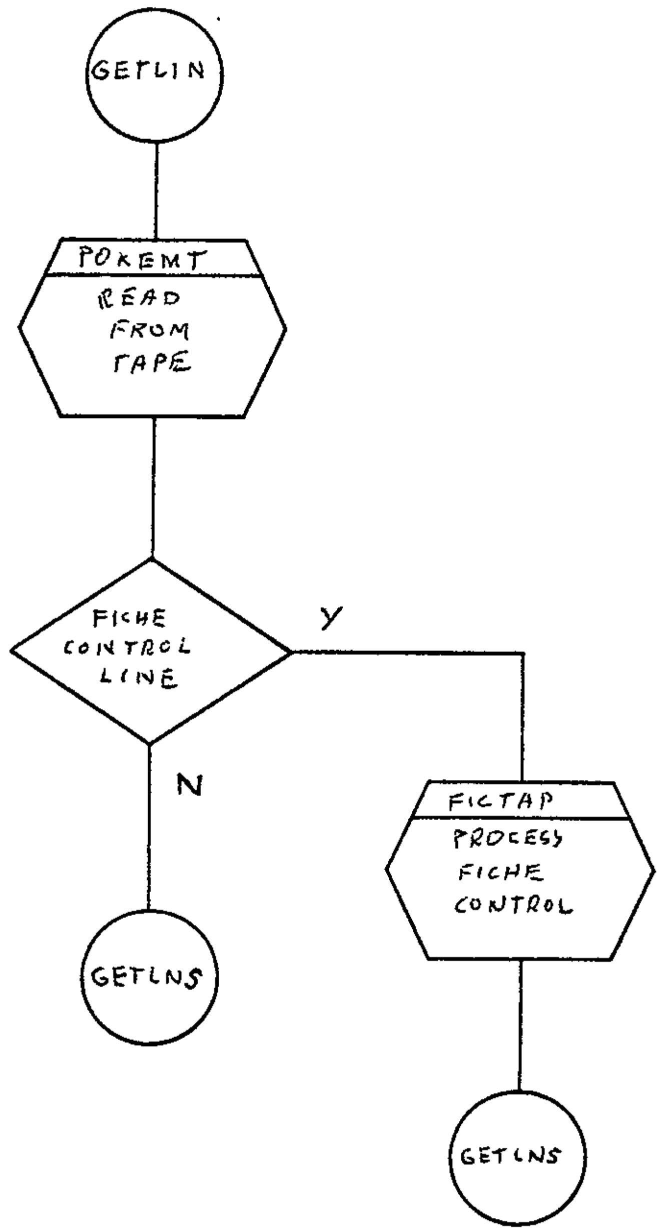

FCPROC
SET FLAG FOR PROCESS AFTER
NEXPAG
GO TO NEXT PAGE
SET PRINT LOOP TO STORE AWAY FICHE CONTROL LINE
FCAAAB

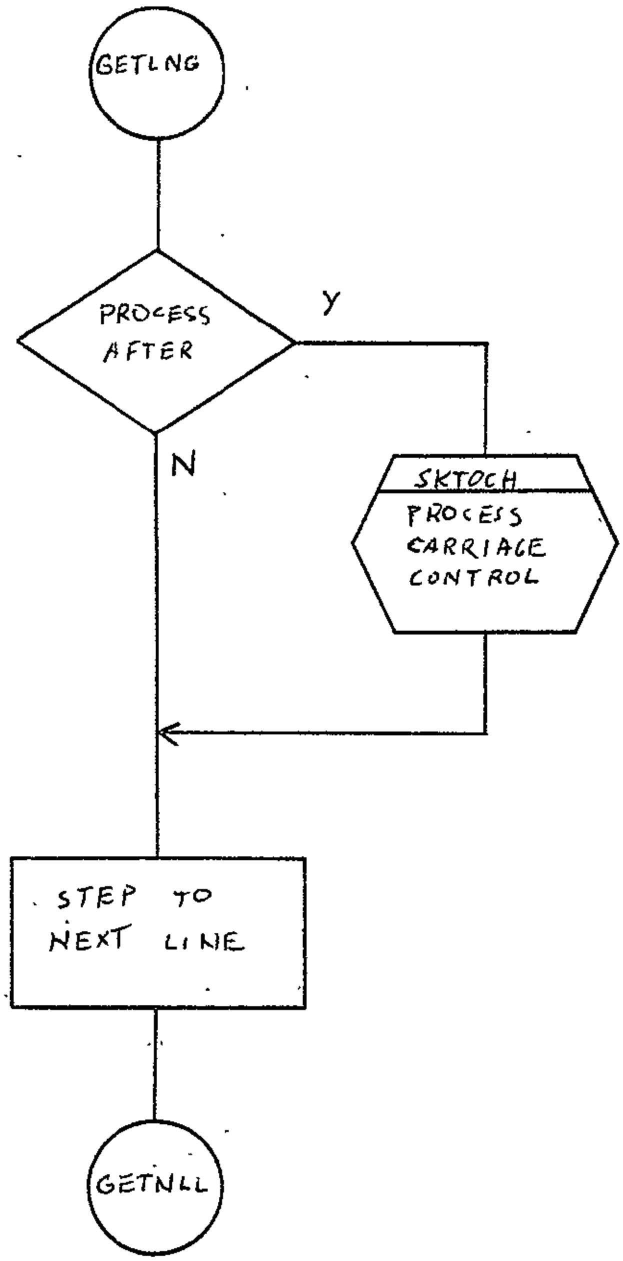

GETSBT
SET FOR SPACE AFTER IF BIT 9 IS SET
GETLN5
PROCESS BEFORE
Y
N
SKTOCH
PROCESS CARRIACE CONTROL
GETLN4
SET UP FOR PRINT OR CAMERA SYNC
FCAAAB

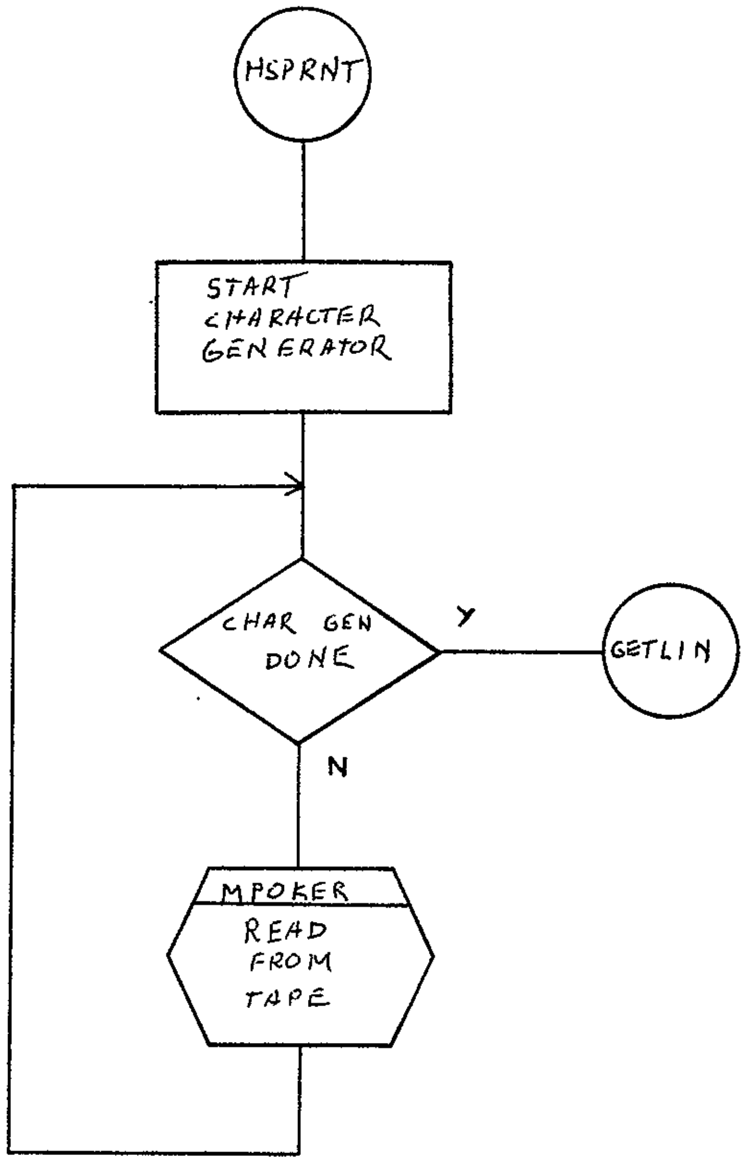

FCAAAB
SET PARAMETERS FOR PRINT LOOP
ANY CHARACTERS TO PRINT
N
GETNLL
Y
PRINT 1 CHARACTER AT A TIME
Y
PRINT
N
HSPRNT

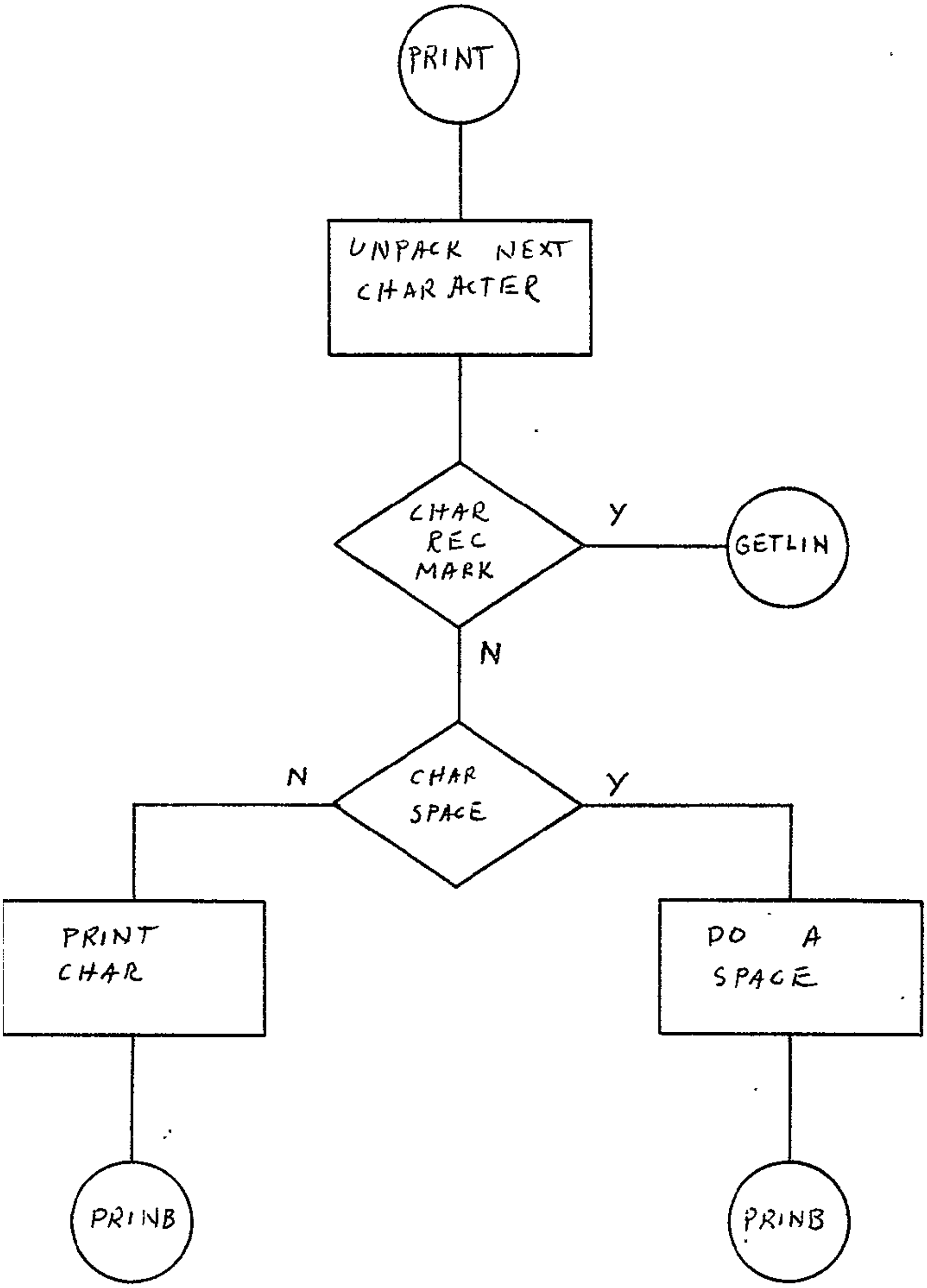

GETLN8
SET CHARACTER COUNT TO ZERO
GETLIN

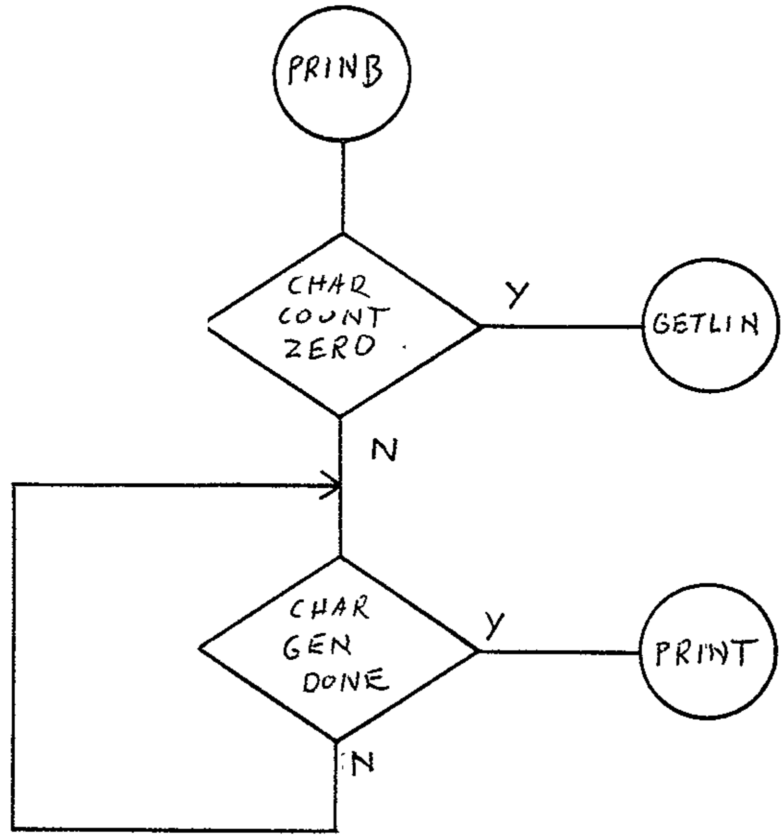

NEWJB1
INITIALIZE PRINT PARAMETERS
NEXPAG
FORCE PAGE EJECT
105mm
Y
N
GETLNS
FCFIN
FINISH LAST FICHE
PKYBLS
CHECK FOR OPERATOR INTERRUPT
FRSPIC
INITIALIZE FOR FIRST PICTURE
GETLNG
GETLNS

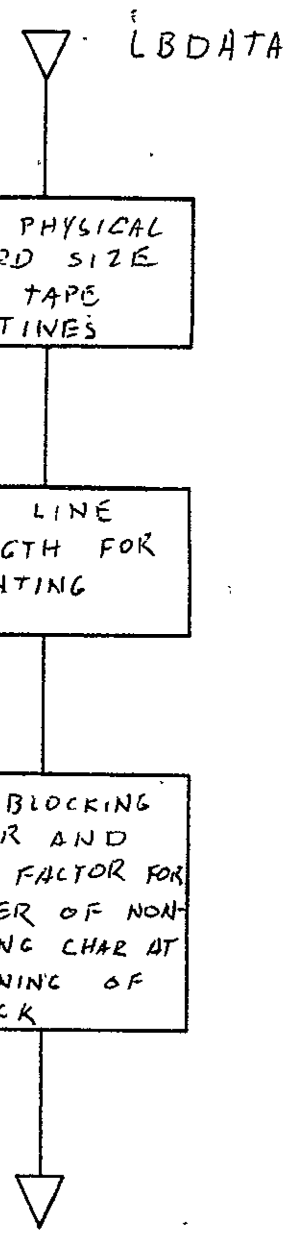

GETLIN
POKEMT
READ FROM TAPE
FICHE CONTROL LINE
Y
N
FICTAP
PROCESS FICHE CONTROL
GETLNS
GETLNS

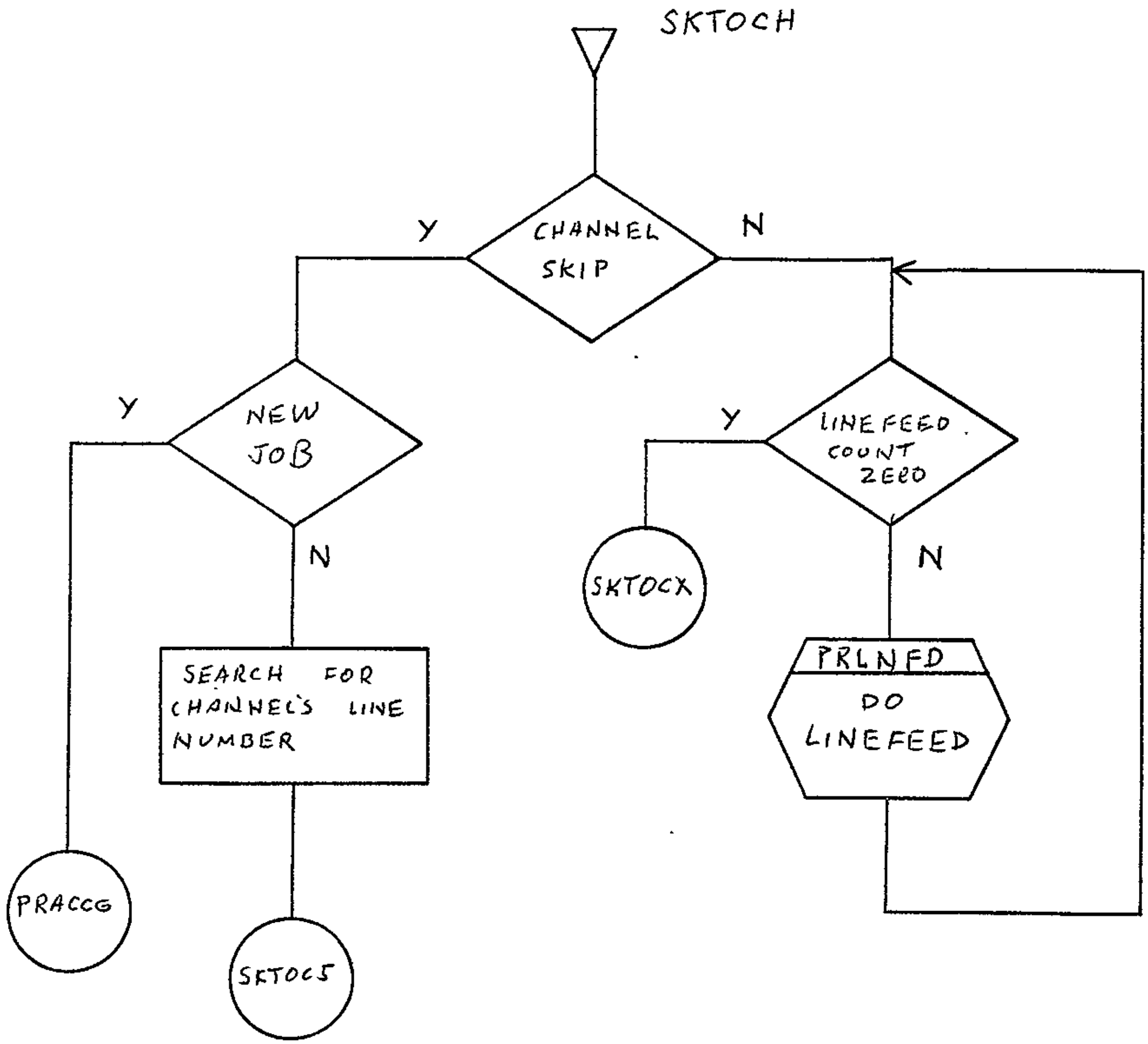

GETLNG
PROCESS AFTER
Y
N
SKTOCH
PROCESS CARRIAGE CONTROL
STEP TO NEXT LINE
GETNLL

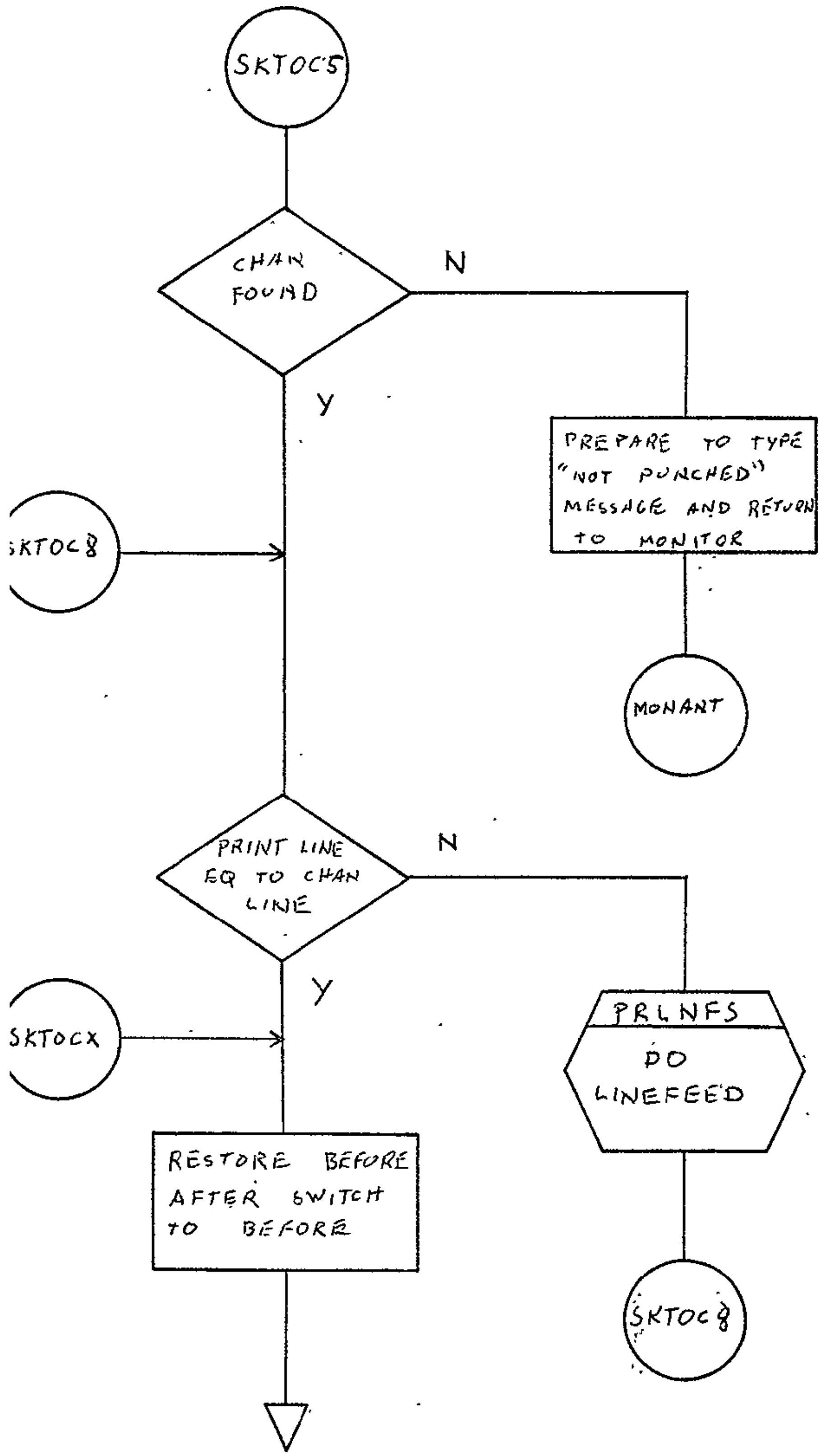

HSPRNT
START
CHARACTER
GENERATOR
CHAR GEN
DONE
Y
GETLIN
N
MPOKER
READ
FROM
TAPE

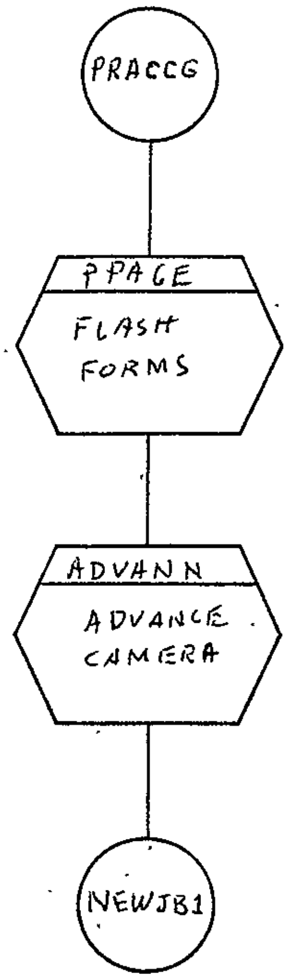

PRINT
UNPACK NEXT CHARACTER
CHAR REC MARK
Y
GETLIN
N
CHAR SPACE
N
Y
PRINT CHAR
DO A SPACE
PRINB
PRINB

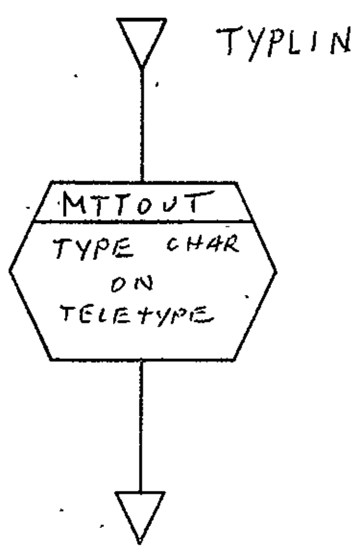

PRINB
CHAR COUNT ZERO
Y
GETLIN
N
CHAR GEN DONE
Y
PRINT
N

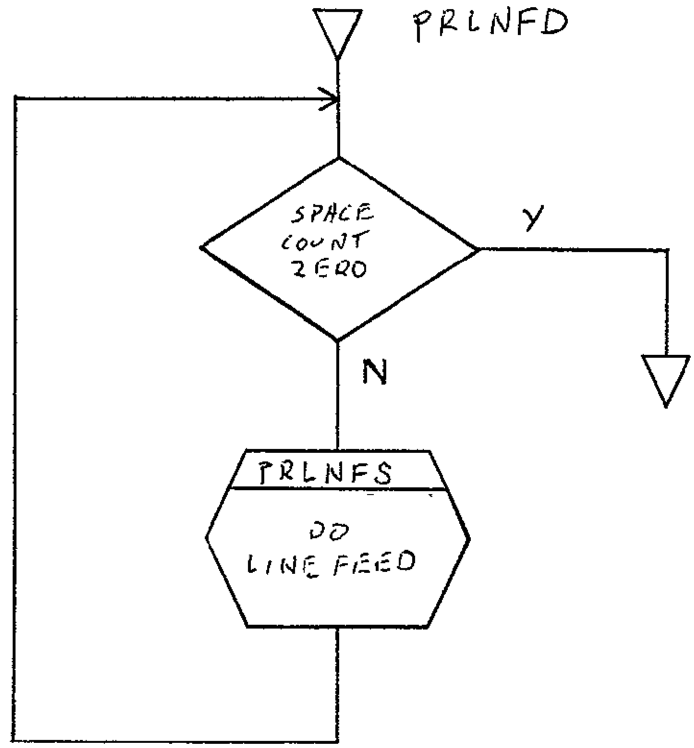

LBDATA
SET PHYSICAL RECORD SIZE FOR TAPE ROUTINES
SET LINE LENGTH FOR PRINTING
SET BLOCKING FACTOR AND SKIP FACTOR FOR NUMBER OF NON-PRINTING CHAR AT BEGINNING OF BLOCK

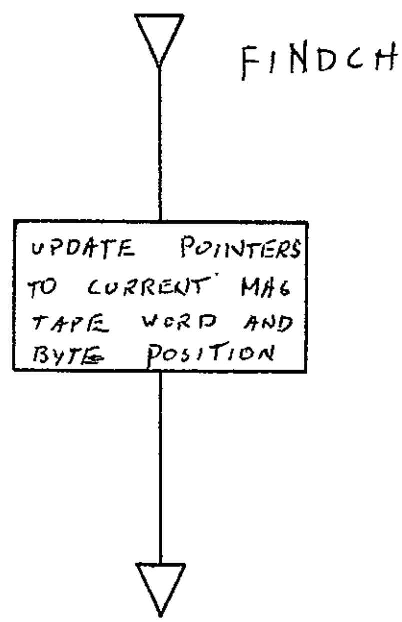

SKTOCH
CHANNEL SKIP
Y
N
NEW JOB
Y
N
SEARCH FOR CHANNEL'S LINE NUMBER
PRACCG
SKTOC5
LINEFEED COUNT ZERO
Y
N
SKTOCX
PRLNFD
DO LINEFEED

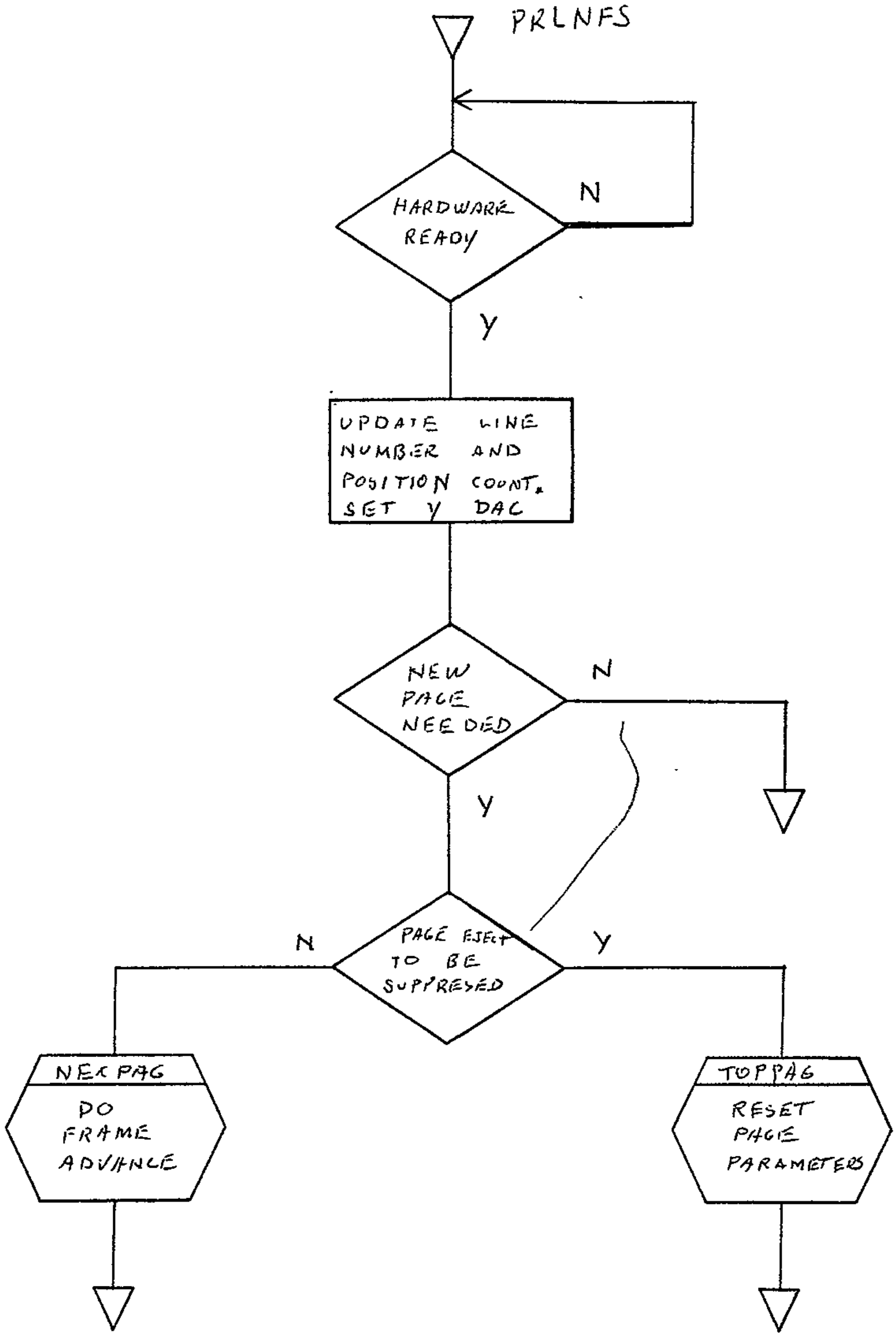

SKTOC5
CHAN FOUND
N
Y
PREPARE TO TYPE "NOT PUNCHED" MESSAGE AND RETURN TO MONITOR
MONANT
SKTOC8
PRINT LINE EQ TO CHAN LINE
N
Y
PRLNFS
DO LINEFEED
SKTOCX
RESTORE BEFORE AFTER SWITCH TO BEFORE
SKTOC8

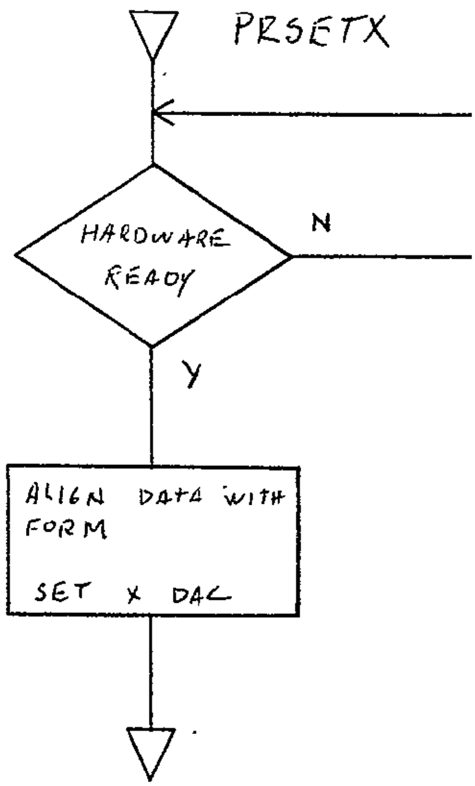

PRACCG
PPAGE
FLASH FORMS
ADVANN
ADVANCE CAMERA
NEWJB1

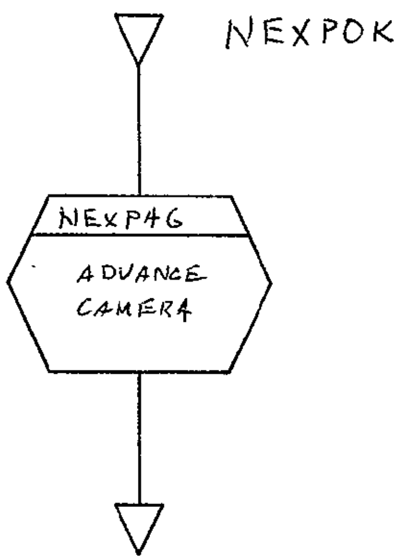

TYPLIN
MTTOUT
TYPE CHAR ON TELETYPE

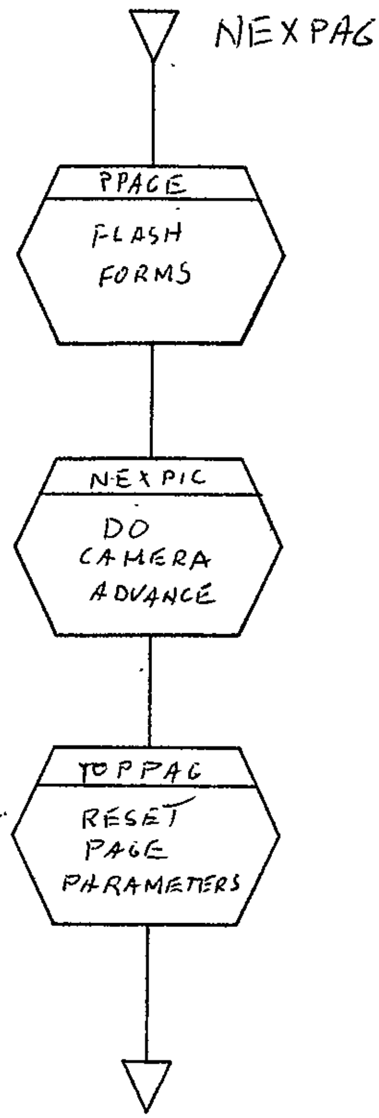

PRLNFD
SPACE COUNT ZERO
Y
N
PRLNFS
DO LINE FEED

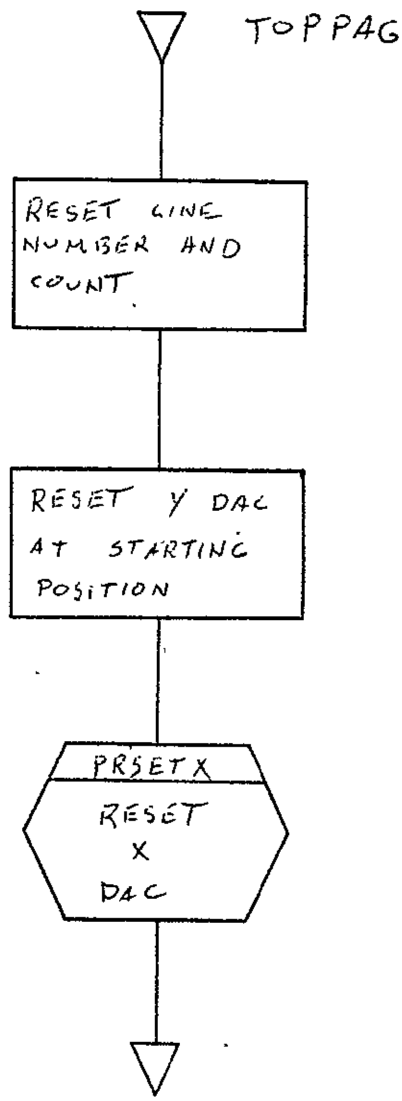

FINDCH
UPDATE POINTERS TO CURRENT MAG TAPE WORD AND BYTE POSITION

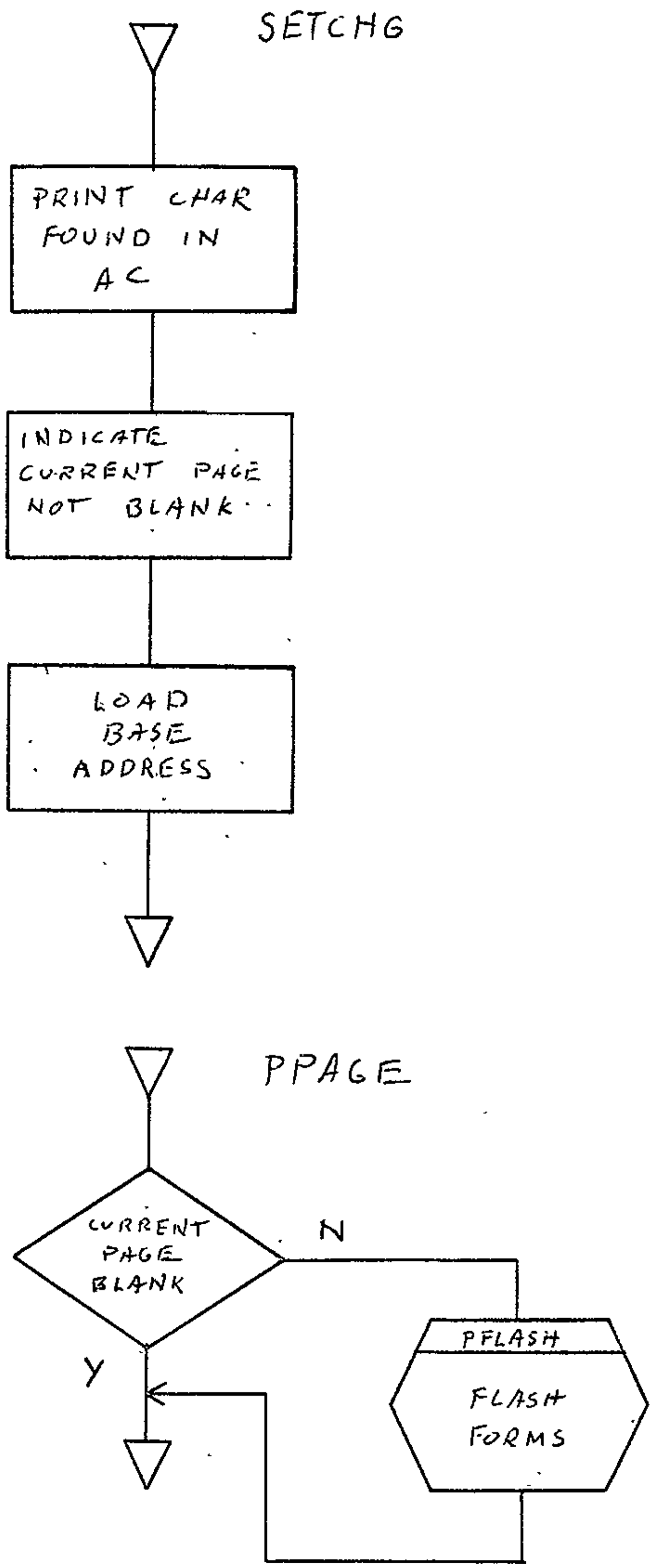

PRLNFS
HARDWARE READY
N
Y
UPDATE LINE NUMBER AND POSITION COUNT. SET Y DAC
NEW PAGE NEEDED
N
Y
PAGE EJECT TO BE SUPPRESED
N
Y
NEXPAG
DO FRAME ADVANCE
TOPPAG
RESET PAGE PARAMETERS

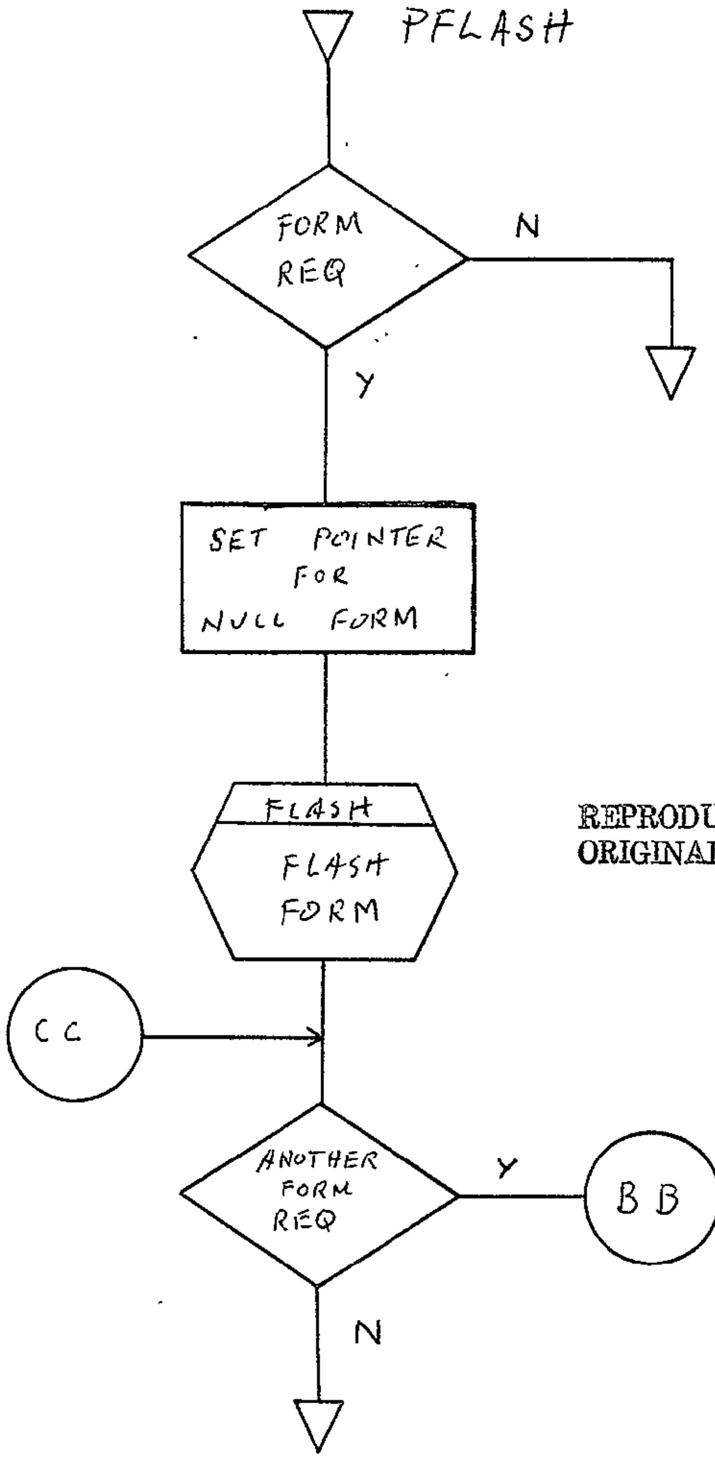

PRSETX
HARDWARE READY
N
Y
ALIGN DATA WITH FORM
SET X DAC

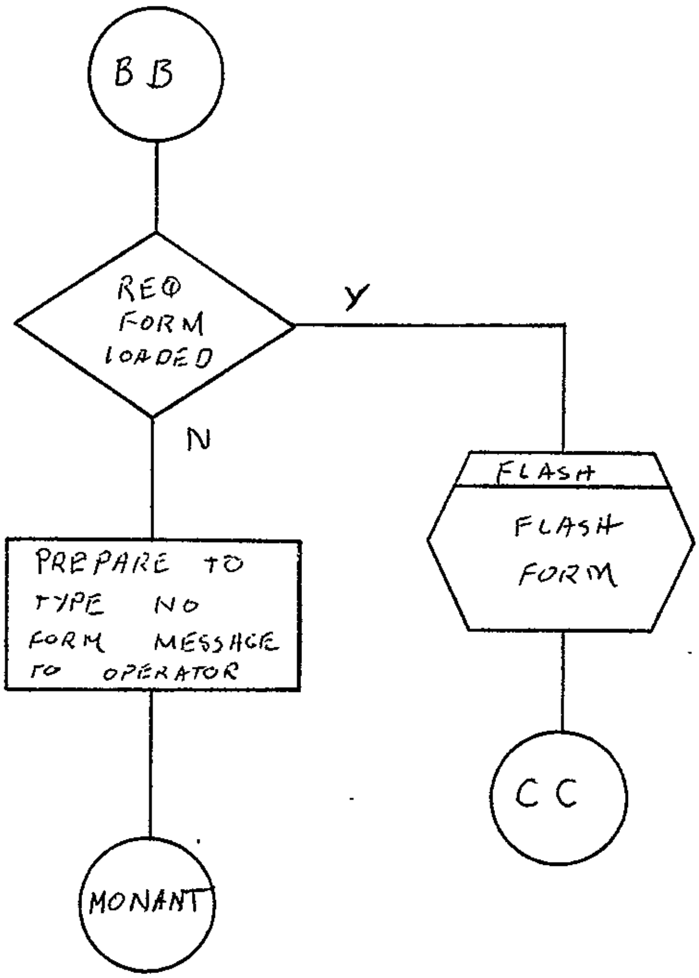

NEXPOK
NEXP4G
ADVANCE CAMERA

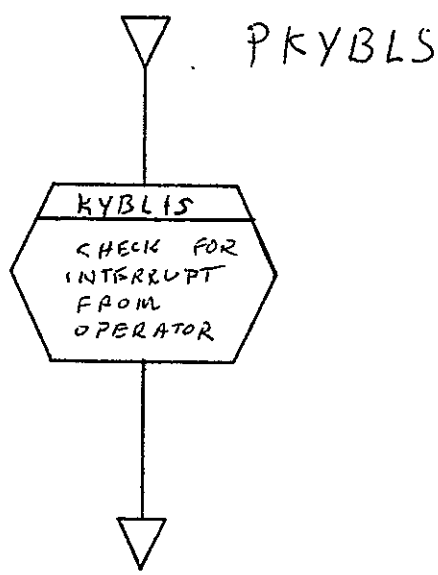

NEXPAG
PPAGE
FLASH FORMS
NEXPIC
DO CAMERA ADVANCE
TOPPAG
RESET PAGE PARAMETERS

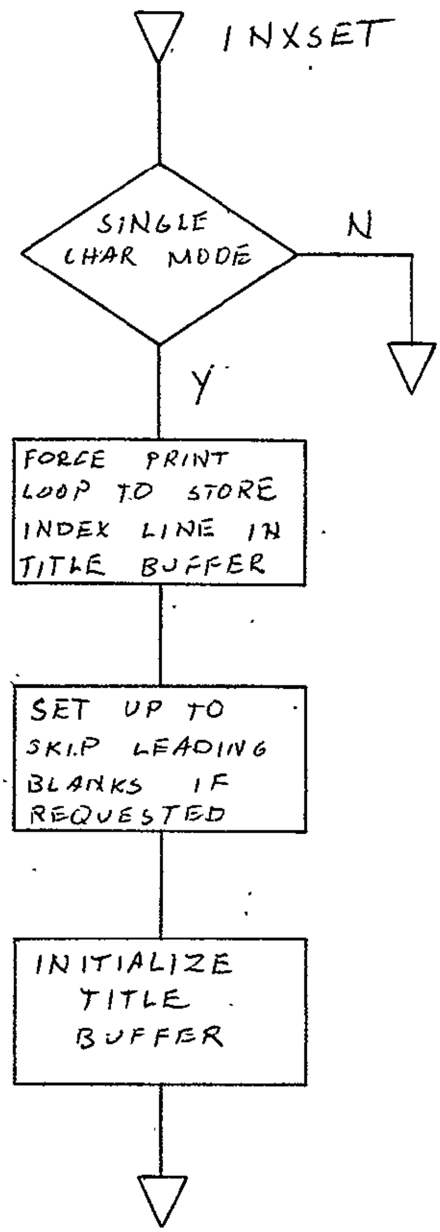

TOPPAG
RESET LINE NUMBER AND COUNT
RESET Y DAC AT STARTING POSITION
PRSETX
RESET X DAC

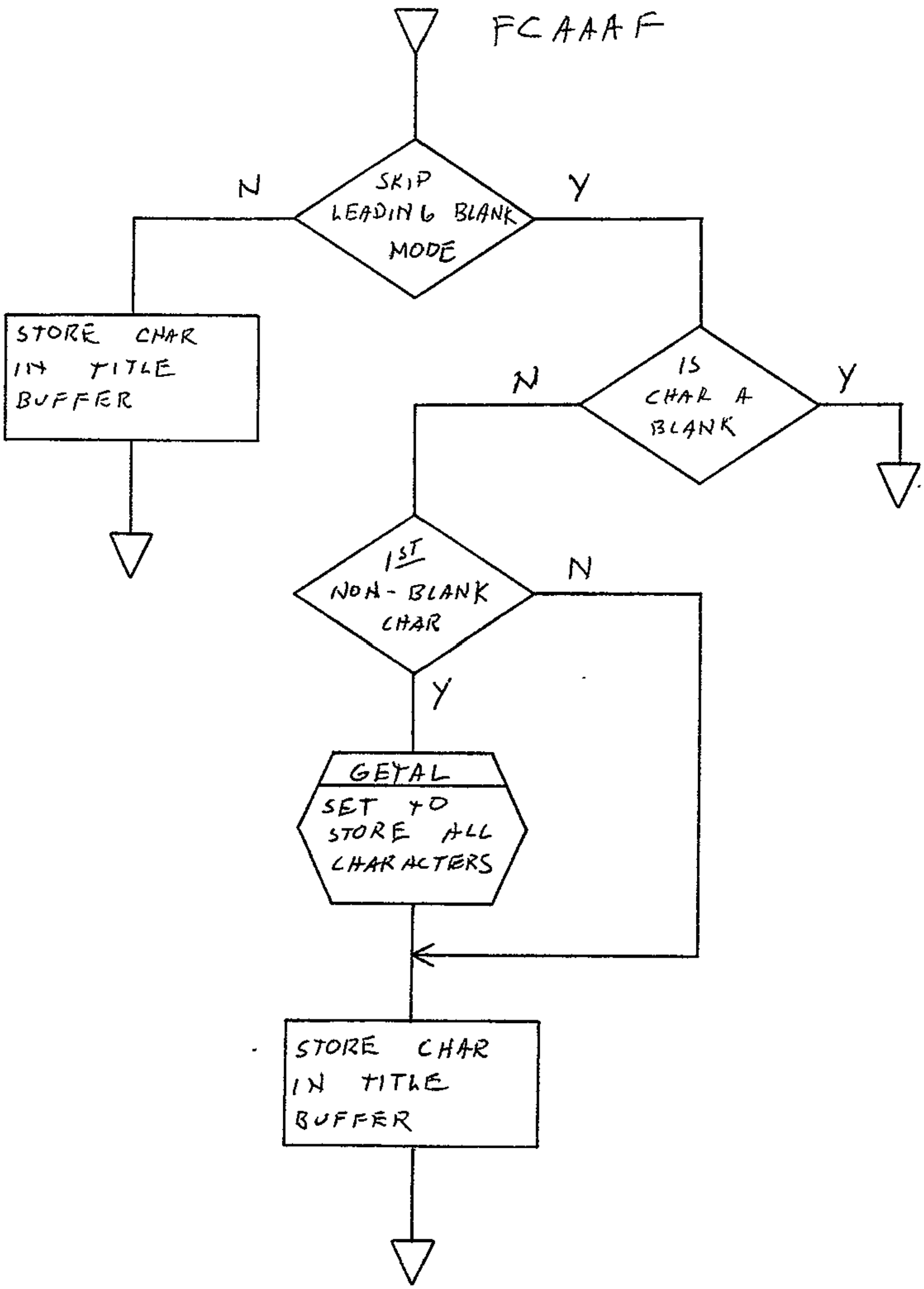

SETCHG
PRINT CHAR FOUND IN AC
INDICATE CURRENT PAGE NOT BLANK
LOAD BASE ADDRESS
PPAGE
CURRENT PAGE BLANK
N
Y
PFLASH
FLASH FORMS

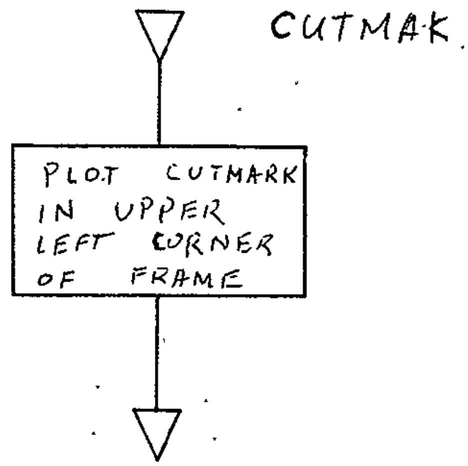

PFLASH
FORM REQ
N
Y
SET POINTER FOR NULL FORM
FLASH
FLASH FORM
CC
ANOTHER FORM REQ
Y
BB
N

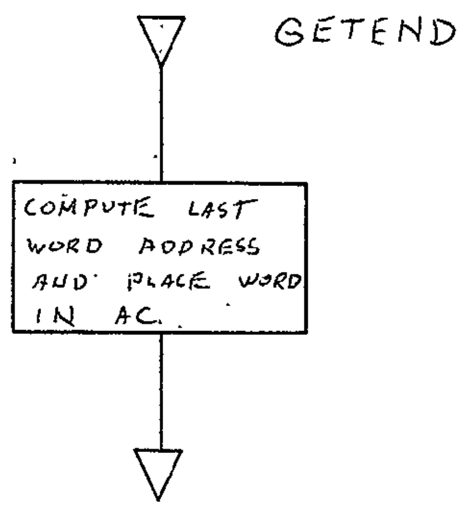

BB
REQ FORM LOADED
Y
N
FLASH
FLASH FORM
PREPARE TO TYPE NO FORM MESSAGE TO OPERATOR
CC
MONANT

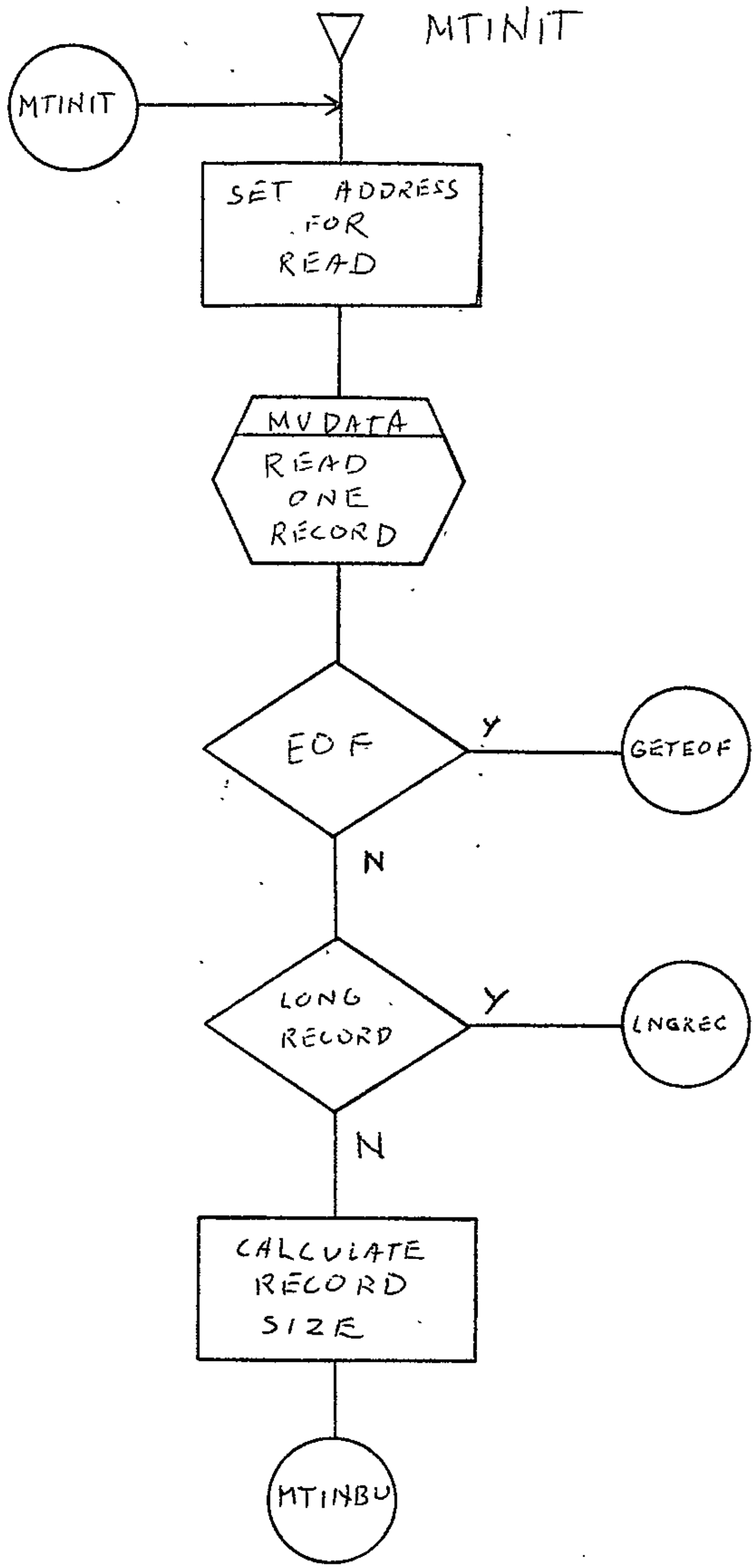

PKYBLS
KYBLIS
CHECK FOR INTERRUPT FROM OPERATOR

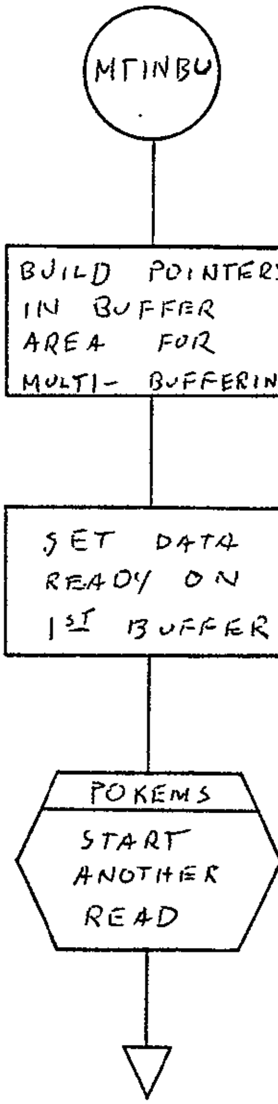

INXSET
SINGLE CHAR MODE
N
Y
FORCE PRINT LOOP TO STORE INDEX LINE IN TITLE BUFFER
SET UP TO SKIP LEADING BLANKS IF REQUESTED
INITIALIZE TITLE BUFFER

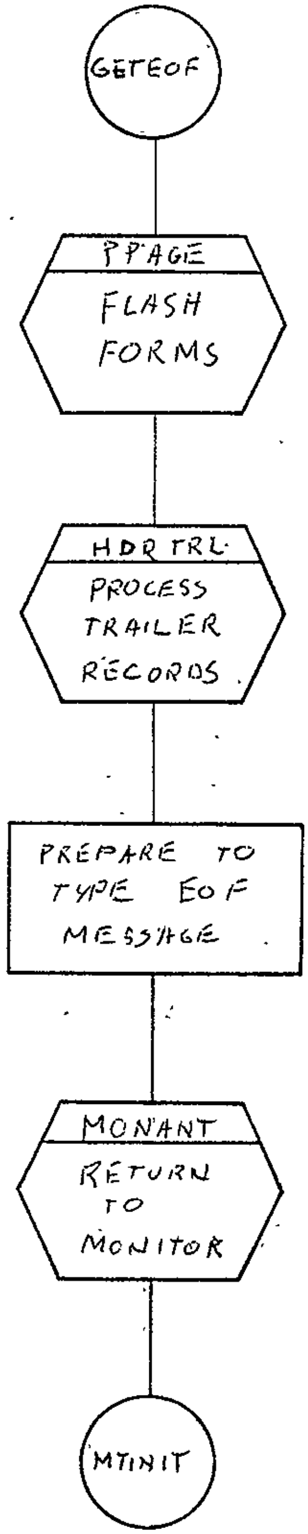

FCAAAF
SKIP LEADING BLANK MODE
N
Y
STORE CHAR IN TITLE BUFFER
IS CHAR A BLANK
N
Y
1ST NON-BLANK CHAR
N
Y
GETAL
SET TO STORE ALL CHARACTERS
STORE CHAR IN TITLE BUFFER

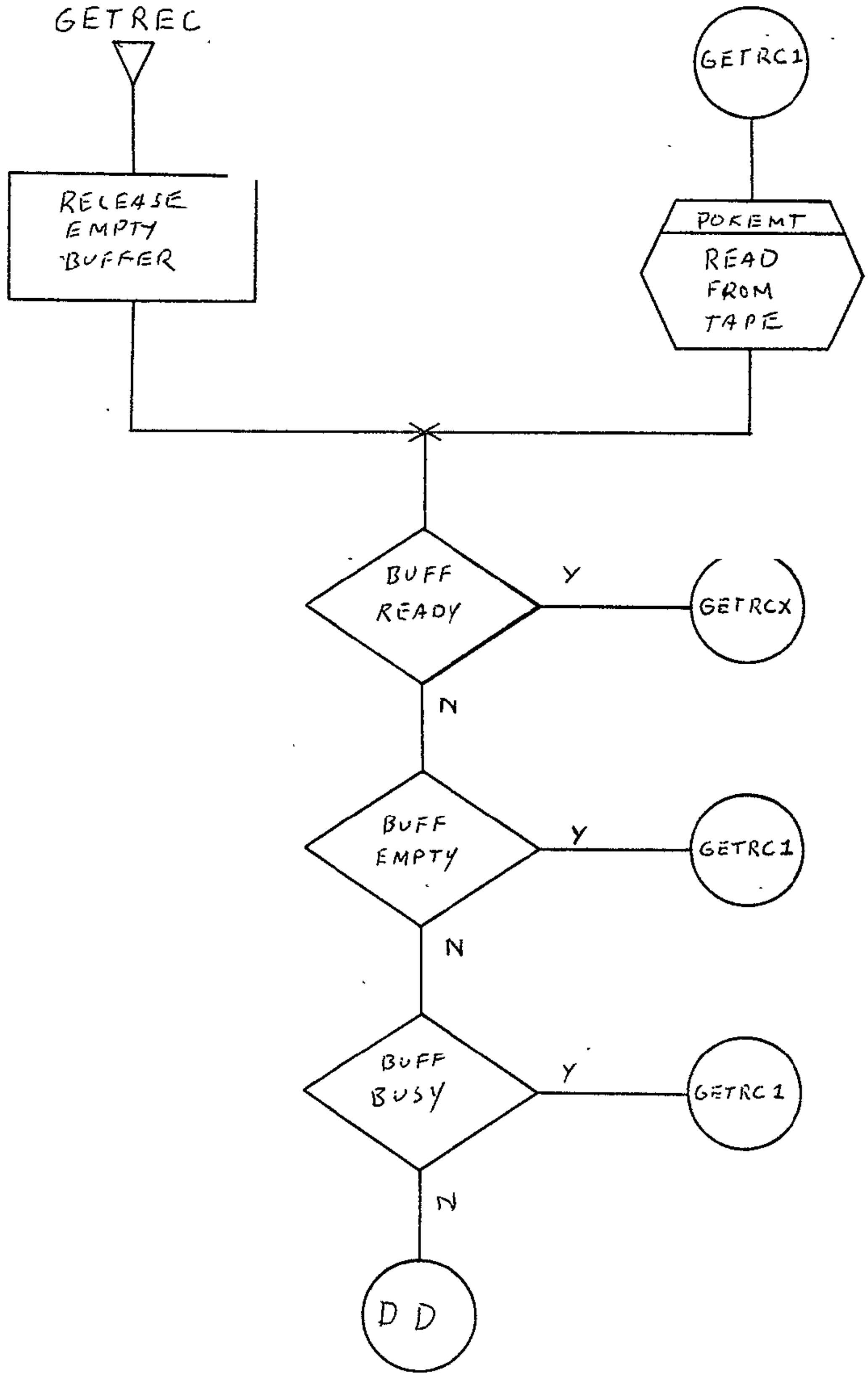

CUTMAK
PLOT CUTMARK IN UPPER LEFT CORNER OF FRAME

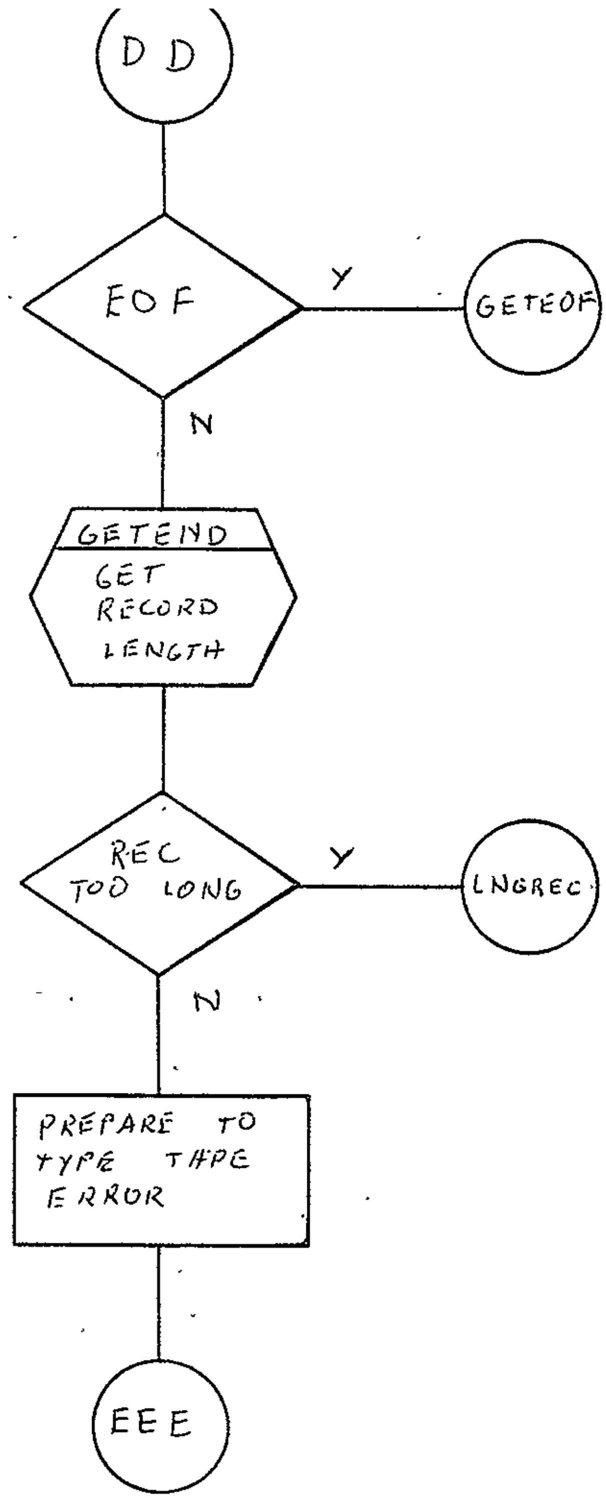

GETEND
COMPUTE LAST WORD ADDRESS AND PLACE WORD IN AC.

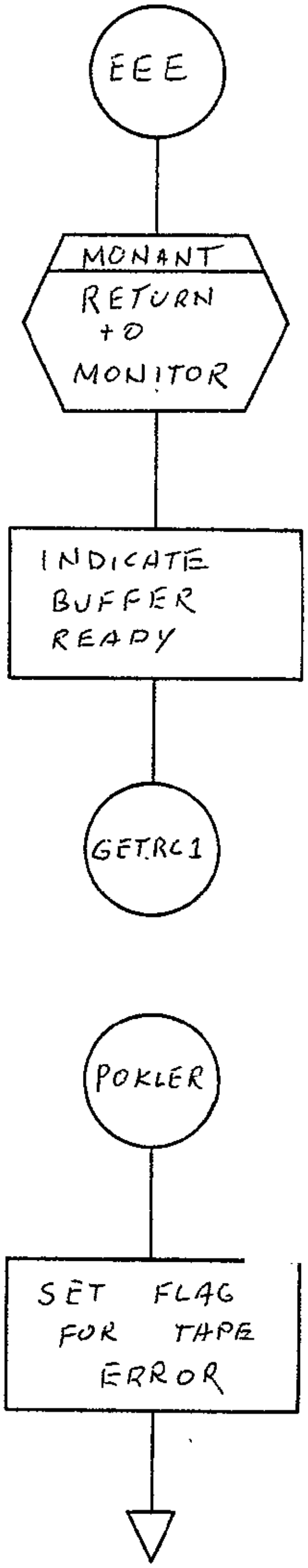

MTINIT
MTINIT
SET ADDRESS FOR READ
MVDATA
READ ONE RECORD
EOF
Y
GETEOF
N
LONG RECORD
Y
LNGREC
N
CALCULATE RECORD SIZE
MTINBU

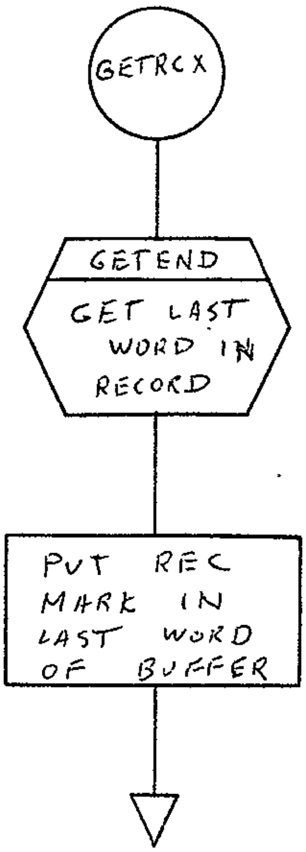

MTINBU
BUILD POINTERS IN BUFFER AREA FOR MULTI-BUFFERING
SET DATA READY ON 1ST BUFFER
POKEMS
START ANOTHER READ

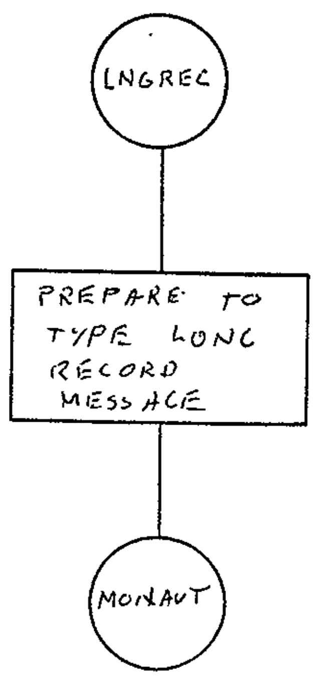

GETEOF
PPAGE
FLASH FORMS
HDR TRL
PROCESS TRAILER RECORDS
PREPARE TO TYPE EOF MESSAGE
MONANT
RETURN TO MONITOR
MTINIT

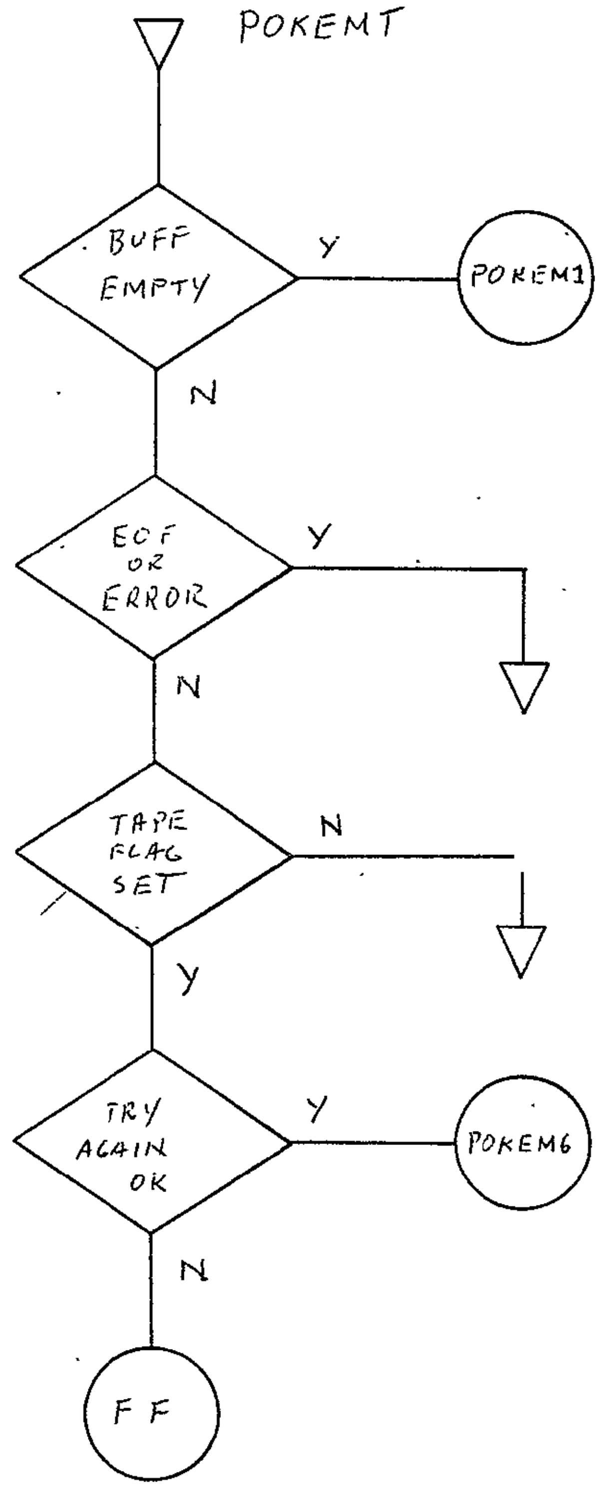

GETREC
RELEASE EMPTY BUFFER
GETRC1
POKEMT
READ FROM TAPE
BUFF READY
Y
GETRCX
N
BUFF EMPTY
Y
GETRC1
N
BUFF BUSY
Y
GETRC1
N
DD

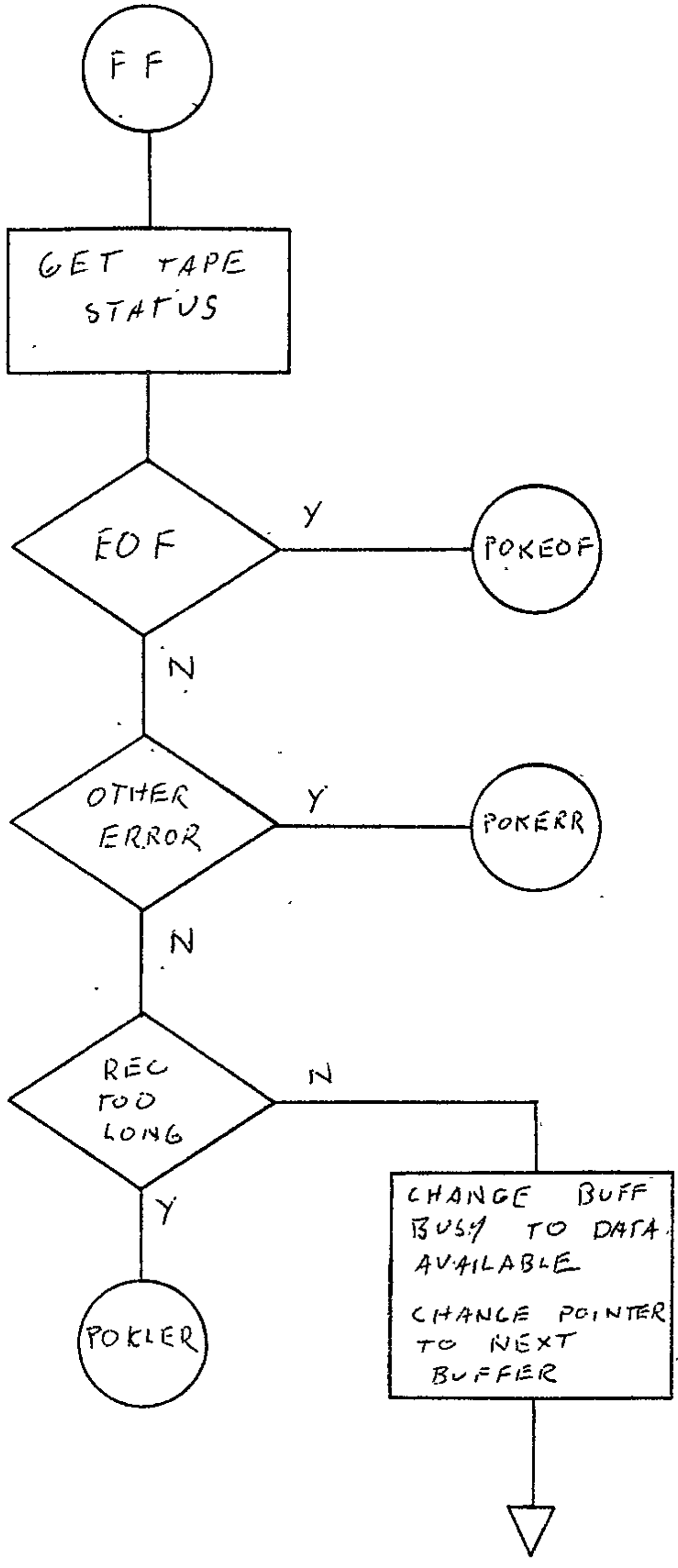

DD
EOF
Y
GETEOF
N
GETEND
GET
RECORD
LENGTH
REC
TOO LONG
Y
LNGREC
N
PREPARE TO
TYPE TAPE
ERROR
EEE

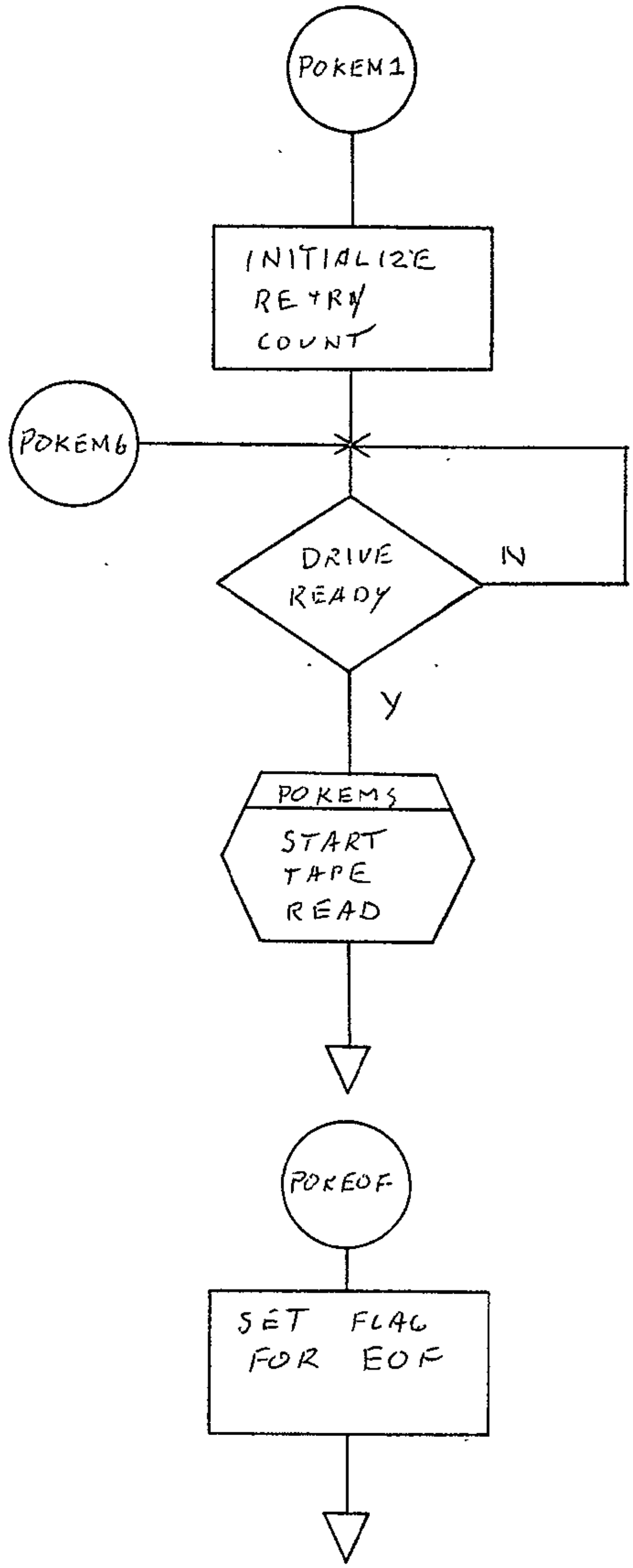

EEE
MONANT
RETURN to MONITOR
INDICATE BUFFER READY
GETRC1
POKLER
SET FLAG FOR TAPE ERROR

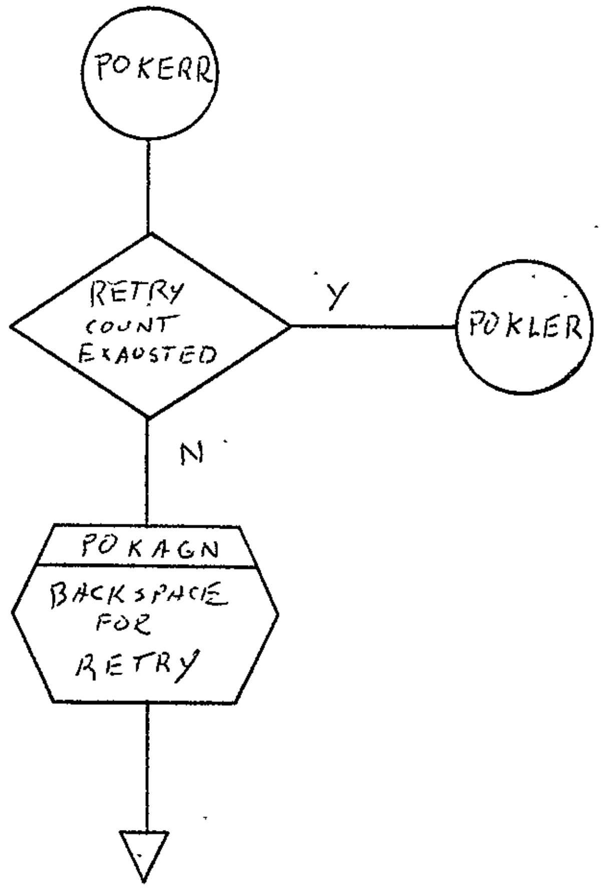

GETRCX
GETEND
GET LAST WORD IN RECORD
PUT REC MARK IN LAST WORD OF BUFFER

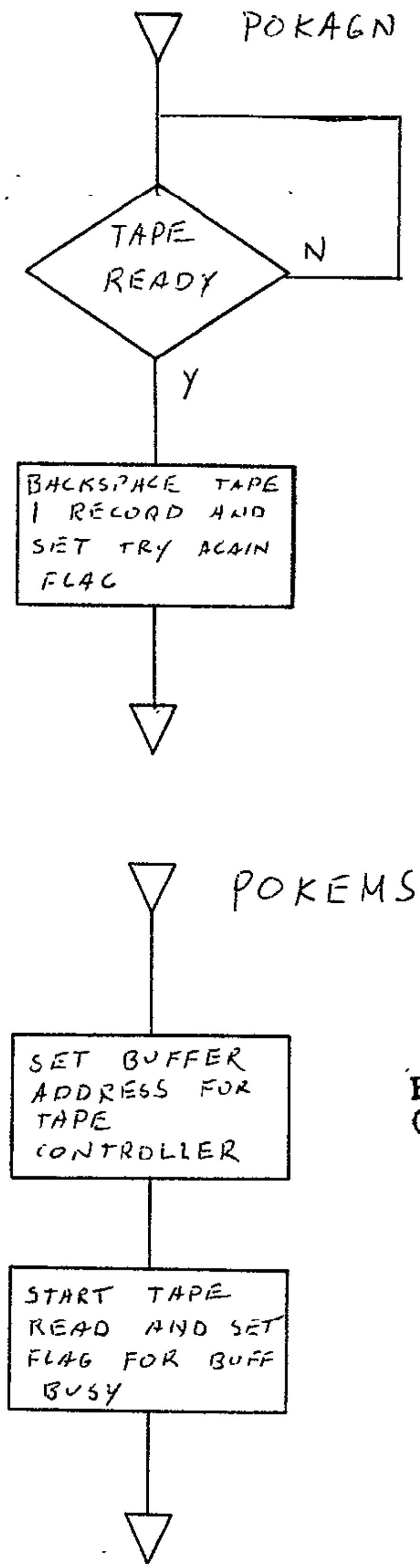

LNGREC
PREPARE TO TYPE LONG RECORD MESSAGE
MONAUT


POKEMT
BUFF EMPTY
Y
POKEM1
N
EOF OR ERROR
Y
N
TAPE FLAG SET
N
Y
TRY AGAIN OK
Y
POKEM6
N
FF


FF
GET TAPE STATUS
EOF
Y
POKEOF
N
OTHER ERROR
Y
POKERR
N
REC TOO LONG
N
Y
POKLER
CHANGE BUFF BUSY TO DATA AVAILABLE
CHANGE POINTER TO NEXT BUFFER


POKEM1
INITIALIZE
RETRY
COUNT
POKEM6
DRIVE
READY
N
Y
POKEMS
START
TAPE
READ
POKEOF
SET FLAG
FOR EOF


POKERR
RETRY COUNT EXAUSTED
Y
POKLER
N
POKAGN
BACKSPACE FOR RETRY


POKAGN
TAPE READY
N
Y
BACKSPACE TAPE 1 RECORD AND SET TRY AGAIN FLAG
POKEMS
SET BUFFER ADDRESS FOR TAPE CONTROLLER
START TAPE READ AND SET FLAG FOR BUFF BUSY

2.10 COMA HARVARD COLLEGE OBSERVATORY SOLAR EXPERIMENT S055 GRAY-LEVEL 7-TRACK OR 9-TRACK PROCESSOR (HCO)

2.10.1 Background

A. Author. F. C. Ashton, Aeronutronic Ford Corp.

B. Intent. HCO is requested when a Harvard College Observatory Experiment S055 gray-level 7-track or 9-track has been submitted for data to be output to 105 mm fiche.

C. Program History

1. Production Tape Date. 28 November 1973
2. Author. F. C. Ashton
3. Authorization. FR80 microfilm system task A13
4. Test Case. Test tape requirement, specification SH-25723
5. Revisions. Reference Appendix B, paragraph B.10

2.10.2 Introduction

2.10.2.1 Hardware Requirements

- FR80 with 12K memory
- 9-track or 7-track tape unit
- 105 mm fiche camera.

2.10.2.2 Software Requirements. The following files, found in I.I.I.'s SYM Directory, are required.

III109	III104	III147	III188
III166	III163	III162	III161 GO
PHOBAT	III185	III161	III186

2.10.2.3 Assembly Parameters. The assembly parameters in III109 should be set for the proper machine configuration. Assembly parameters specific to HCO program are as follows.

A. WEDGE. Defines code to allow nine step wedges to be placed on ID fiche.

B. 7-TRACK. If 1, indicates data will be coming from a 7-track tape drive.

C. FONT. If 0, indicates standard I.I.I. character FONT

D. TAPELB. If 1, indicates standard IBM tape labels.

E. NASA. If 1, indicates special characters used at JSC.

F. EBCDIC. If 1, indicates standard IBM EBCDIC character set.

G. LOCASE. If 1, indicates lower-case character set.

H. BIGBUF. If 0, allows maximum amount of features with minimum buffer space.

I. MTSIZE. Defines length of system tape buffers (513 words).

J. MTTSIZE. Defines length of teletype buffer (192 words).

K. MANYUP. Indicates that page count is printed with frame count when the accounting information is output to the teletype.

L. FTYPE. Indicates the fiche camera.

M. DSKMON. Indicates that disk monitor routine is to be assembled.

N. NEXPAG. Equivalent to NEXPIC routine.

2.10.2.4 <u>Operator Commands</u>

```
*
*TIME=1'26.1"
*FRAME=0
*GO
*CONTINUE
*TITLE
*END JOB
*MAKE FILM=1
*CLEAR
*ADVANCE
*TAPE TYPE - 2,5,8 OR 9=9
*BACK
*PARITY=1
*USE=1
*REWIND
*SKIP
*TRY AGAIN=10
*STANDARD LABELS=NO
*UNLABELLED=YES
*PITCH-MARGIN=44,97
*SIZE OF TITLE=9223,615(
*IMAGES PER FICHE=12,8
*HITS-CHARS,VEC,PTS,TITLE,CMARK=1,1,1,2,1
*FOCUR
*LOAD=HCO
*ROTATION=0
*PROCESS JOBS (0=ALL,N=N JOBS)=0
*LIST(0=NO,1=YES)=0
*
```

2.10.3 Analysis

2.10.3.1 Major Control Section

A. Description. Control is given the HCO Program at the location BEGIN. The tape handler is initialized by calling MTRINI, with MTAREA being set to the tape buffer address of EXPND and PBUFSZ set to 700 words. The job count, JJOBID, is initialized to zero. TITSW2 is set to NOP for title search routine. TPOINT, the pointer for fiche titles, is set to begin at the Title Table, FICTBS.

The intensity of the PLS is set to 32. A call is made to the BATNO Subroutine, which accepts from teletype the COM tape number, the source tape, and film roll number. BATNO initializes the fiche title routine, FICTAP, for the ID fiche. On the ID fiche, the program outputs nine different gray-step pages. Each page is 600 pixels by 600 lines. The nine-step intensities are 1, 9, 17, 25, 33, 41, 49, 57, and 63. When each page is output, the image is rotated 90° to the title lines.

The program makes a call to the TREC Subroutine to process the title record. A call to the HDREC Subroutine is made to check for additional title records and skips records. Then HDREC rotates the image 90° to the title and processes three header lines per page of gray data. The starting X and Y coordinates for gray-level data are set by calling the SETXYS Subroutine. The number of records per gray-level page, LNCNT, is set to 60.

At the tag, REPLN, the parameter for the read subroutine, RDWD, and the get subroutine, GTIN, are initialized. The address for the line identification is saved off by a call to SETAD. The subroutine PESET sets spacing for the gray-level pixel.

At the tag, RSMLN, the number of input pixels, PEXCT, is set to 120 and the GTIN Subroutine is called to output a pixel line to film. The switch GTSW is set to NOP to pickup pixel data from TABBUF Table. The same line of data is repeated nine times. The eight characters of line ID are output by calling the ECBCD Subroutine. Then a line of gray pixel is output again. The last four characters of the record are bypassed. The starting X coordinate is offset by 20 scope points to give a sawtooth effect.

The program returns to the tag REPLN until 60 lines of pixel data is processed. The image is then rotated back 90° to title rotation and the intensity of the PLS is set to 32. The fiche is advanced one frame. The program continues this loop, starting at the tag HEADER, until end-of-file is reached.

B. Input/Output

1. Input. Data is input from a 7-track or 9-track drive. The tape can be standard IBM label, nonstandard label or unlabeled. The data shall be in a fixed-length record format (blocked) with 1320 eight-bit bytes per block. Each logical record shall be 132 bytes in length. A logical record contains a title record, skip record, or gray-level record. A title record has HEX D9 in the first byte of the record. The second byte contains an EBCDIC T, followed by 130 bytes of title information. A skip record has HEX D9 in the first byte of the record. The second byte contains an EBCDIC J, followed by 130 bytes of EBCDIC blank. A gray-level record has eight bytes of EBCDIC characters, followed by 120 bytes of pixels and four bytes of EBCDIC blank.

2. Output. Output of data is on 105 mm fiche ([illegible] rows by 12 columns). The first row of data is title information.

3. Message Output

   a. CONTROL ERROR. This is output to the teletype when the first logical record on the file is not a title record.

b. TITLE ERROR. This is output to the teletype when the title record is in error.

c. JOB ID NO. The title information is output to the teletype along with this message.

d. ENTER SOURCE TAPE. This is output to the teletype and the mainline waits for the source tape number. The operator types up to 12 characters of information.

e. ENTER COM TAPE. This is output to the teletype and the mainline waits for the COM tape number. The operator types up to 12 characters of information.

f. ENTER ROLL. This is output to the teletype and the mainline waits for the roll number. The operator types in 12 characters of information.

C. Linkages

1. External

Routine	Program
FCFIN	III166 ADVAN
FC7CLR	III166 ADVAN
FICTAP	III188
FRSPIC	III166 ADVAN
GETINAM	III161
GETT	III163
KLBLIS	III166
MDONEX	III166 INVAN
MDOUT	III166
MCRLF	III166 ADVAN
MMESSG	III166 ADVAN
MONOUT	III166 INVAR
MTRINI	III163
NEXPIC	III160 ADVAN
MNBRIT	III166
PSTLL	III166
ROTATE	III166
SETPLS	III166
SETXYS	III160

2. Internal Routines

BATNO	HCOEXT	LSTON	SETAD
BATEND	HDREC	MVCOM	TITPUT
BTTY	HKPJBS	PRESET	TITSR
CKCOM	HOBMOD	PLSET	TTYIT
ECBCD	HOBSKJ	RDWD	
GTIN	IDLST	RSRT	
HBMODE	LSTID	SAVCH	

2.10.3.2 Subroutines

A. BATNO. Accepts source tape number, COM tape number, and roll number from the operator. The subroutine is called to output the title fiche. Calling sequence: JMS BATNO.

B. BATEND. Outputs the trailing ID fiche at end of job. Calling sequence: JMS BATEND.

C. BTTY. Accepts character from teletype and stores one character per word. The subroutine accepts up to 12 characters. If the user wishes to use less than 12 characters, he terminates string of input characters with a carriage return and routine will space fill the rest of the buffer. The subroutine converts ASCII characters to EBCDIC. A rubout character will allow the user to start reinputting the character string. Calling sequence, where LAC is the address of place to store character:

```
LAC
JMS BTTY
```

D. CKCOM. Checks for COM control record of J and T records. If a J control record is detected, a blank frame is recorded on fiche. When a T control record is detected, the count of number of jobs to be run is checked. If the title record is greater than the number of jobs, the routine ends the run. If the title record is less than or equal to the number of jobs, the new title is output to fiche. Calling sequence: JMS CKCOM.

E. ECBCD. Outputs a line of EBCDIC characters to film. Calling sequence, where the first LAC is the address of the buffer and the second is the negative number of characters:

```
LAC
DAC ADDSV
LAC
JMS ECBCD
```

F. GTIN. Gets a pixel value and outputs the pixel five times to film. When the GTSW switch is set to a SKIP, the pixel value is picked up from the tape buffer, complemented and stored in the table TABBUF. When the GTSW switch is set to NOP, the pixel is picked up from TABBUF. Calling sequence:

```
LAC (SKP or NOP)
DAC GTSW
JMS GTIN
```

G. HBMODE. Called by MONITOR to get the number of jobs to process. Calling sequence: DAC HBMODE.

H. HCOEXT. Called when END JOB is typed in. The subroutine rotates image, sets the title intensity, and outputs trailing ID fiche. Calling sequence: JMS HCOEXT

I. HDREC. Calls KYBLIS to check for console intervention, CKCON to check for a COM control record, ROTATE to rotate the image, SETXYS to set the starting X and Y coordinates, and PLSET to set the spacing for ALPHA MODE. The subroutine outputs three lines of header information. Calling sequence: JMS HDREC.

J. HKPJBS. Called by MONITOR to display the title number. Calling sequence: DAC HKPJBS.

K. HOBMOD. Gets the number of jobs to process and store it in JOBCT. Calling sequence: JMS I HOBMOD.

L. HOBSKJ. Gets the number of titles to skip and stores it in TITRCT. The subroutine sets TITSW to JMS TITSR. Calling sequence: JMS I HOBSKJ.

M. IDLST. Displays the list ID YES or NO flag. Calling sequence: DAC IDLST.

N. LSTID. Gets the LIST ID flag and stores it at IDWHT (0 = no list, 1 = list). When the LIST ID flag is 0, LSTSW is set to NOP. When the flag is 1, LSTSW is set to JMS LSTON, and JITSW is set to TITSR. Calling sequence: JMP I LBTID

O. LSTON. Moves title record information to the title buffer and outputs title to the teletype. Calling sequence: JMS LSTON.

P. MVCOM. Moves the title record from the tape buffer to the title buffer. Calling sequence: JMS MVCOM.

Q. PESET. Sets the spacing and spot size for gray-level output. CHDELX, the X delta spacing, is set to 10 and CHDELY, the Y delta spacing, is set to 10. The spot size is set to 5. Calling sequence: JMS PESET.

R. PLSET. Sets the spacing and the spot size for alphanumeric data. CHDELX, the X delta spacing, is set to 65 and CHDELY the Y delta spacing, is set to 50. The character size is set to 6 and intensity to 48. Calling sequence: JMS PLSET

S. RDRT. Saves the parameters for the tape handler. MTCNT is the word count; MTPTR is address of current line within the buffer. MTBYTW contains next half-word of line. MTBYTC is number of bits in last word. Calling sequence: JMS RDPT.

T. RDWD. Saves the first eight characters of the line in a temporary buffer and stores the intensity in INT. When the routine is initially calling for line data RDSW1 is set to SKIP and the first eight characters are saved. Then RDSW1 is set to NOP for access of the gray-level intensity. Calling sequence, where DAC RDSW1 initially calls for line data:

```
LAC (SKP)
DAC RDSW1
JMS RDWD
```

U. RSRT. Restores parameter for tape handler. Calling sequence: JMS RSRT.

V. SAVCH. Saves off alphanumeric characters in the character buffer, CHRBUF. Calling sequence, when N = number of characters to save off:

```
LAM -N
JMS SAVCH
```

W. SETAD. Loads address of character buffer, CHRBUF, into ADDSV. Calling sequence: JMS SETAD.

X. TITINT. Loads address of the teletype output buffer TITTY into teletype pointer, TITPT, and calls TITWD to set up word count. Calling sequence: JMS TITINT.

Y. TITPUT. Stores three characters per word in the teletype buffer. Calling sequence: JMS TITPUT.

Z. TITSR. Reads down the tape N number of title records. MONITOR's HOBSKP Subroutine stores N, the number of titles to be skipped. Calling sequence: JMS TITSR.

AA. TITWD. Initializes the teletype word buffer to zero and sets number of teletype characters to three. Calling sequence: JMS TITWD.

BB. TTYTIT. Outputs the title to teletype. The title information has to be stored in title buffer. The title buffer addresses is stored in MTTARE. Calling sequence: JMS TTYTIT.

2.10.3.3 Constants and Variables

A. External

1. BCKCOM. Constant used when backspacing tape via MVDATA.

2. CHDELX. Variable that contains X spacing.

3. CHDELY. Variable that contains Y spacing.

4. CHRSIZ. Variable that contains character size.

5. FCXCNT. Constant that contains row count of 12.

6. FCYCNT. Constant that contains column count of 8.

7. FICMAR. Constant containing fiche margin (-96).

8. FICFRM. Constant containing fiche pitch (-43).

9. FICTB. Buffer where title information is stored.

10. MAXTRW. Variable used by the III185 title routine The program initializes MAXTRW to zero.

11. MDISIZ. Constant containing character size of monitor display (63).

12. MDISLF. Constant containing line spacing of monitor display (438 scope points).

13. MDISPL. Constant containing spacing between characters on monitor display (384 scope points).

14. MTAREA. Constant containing the address of tape buffer.

15. MTBYTC. Variable used to count number of bits used in III163.

16. MTBYTW. Variable used to save remainder of unused bits in III163.

17. MTCNT. Variable containing number of words remaining in tape buffer.

18. MTPTR. Variable containing pointer into tape buffer.

19. MTTARE. Constant containing address of title buffer.

20. PBUFSZ. Constant containing number of words in tape buffer (700).

21. PGNAME. Constant containing program name HCO.

22. RECPIN. Variable to hold the intensity.

23. RECSPT. Variable to hold spot size.

24. VCHTAB. Table to use to convert EBCDIC to ASCII.

25. XTITS. Constant containing the starting X coordinate of title (= 2200).

B. Internal

1. ADDSV. Variable containing the address of the characte buffer CHRBUF.

2. ALPHX. Constant (5042) which is starting X coordinate of alphanumeric characters.

3. ALPHY. Constant (10047) which is starting Y coordinate of alphanumeric characters.

4. BATARE. Table for the BEGIN and END ID title fiche.

5. BEGN. Constant; BEGIN for the ID fiche.

6. BTABL. Table used to convert characters from ASCII to EBCDIC.

7. BTCT. Variable used as counter in BATNO Subroutine.

8. BTLN. Constant length of the ID title.

9. CHDELX. Constant of 65; X spacing for alphanumeric characters.

10. CHDELY. Constant of 50; Y spacing for alphanumeric characters.

11. CHRBUF. Variable table to store EBCDIC character, two characters per word.

12. CHRCT. Variable running count of characters per record.

13. CHRPT. Variable pointer into character buffer, CHRBUF.

14. CMTAP. Variable buffer where the COM tape number for the ID fiche is stored.

15. CRSCON. Constant of 1 used to rotate image.

16. CTLMES. Message CONTROL ERROR output to teletype when record on tape is not a COM control record.

17. CTMES. Message ENTER COM TAPE output to teletype when accepting COM tape number for ID fiche.

18. ENEND. Message END put on tail fiche ID.

19. IDWHT. Variable used for display of answer for LIST (0 = NO; 1 = YES).

20. INT. Variable temporary hold for intensity.

21. INTHD. Variable transposed intensity.

22. INTOUT. Constant of 3; title intensity.

23. JJOBID. Variable; actual title number processed.

24. JOBCT. Variable; maximum number of titles to process.

25. LNCNT. Variable; line count per frame.

26. NAMID. Message JOB ID NO output to teletype when title is output.

27. ORCON. Constant of 16 used to offset X coordinate.

28. OTHERC. Constant of 0 used to rotate image.

29. PEDELX. Constant of 10; X spacing for gray-level pixel.

30. PEDELY. Constant of 10; Y spacing for gray-level pixel.

31. PEXX. Constant of 5446; starting X coordinate for first gray-level pixel of image.

32. PEXY. Constant of 10097; the starting Y coordinate for first gray-level pixel of image.

33. PEXCT. Variable used to hold pixels per line.

34. PNTCT. Variable used to hold number of pixel repeats.

35. RDBYC. Variable used as temporary hold for read byte count, MTBYTC.

36. RDBYTW. Variable used as temporary hold for MYBYTW.

37. RDCNT. Variable used as temporary hold for read word count, MTCNT.

38. RDPTR. Variable used as temporary hold for read pointe: MTPTR.

39. RLL. Variable buffer where the roll number is stored for ID fiche.

40. RLMES. Message ENTER ROLL, output to teletype when accepting roll number.

41. RRLN. Variable to hold the repeat line count.

42. SPSIZ. Constant (5) which is the character size of EBCDIC character.

43. SRMES. Message ENTER SOURCE TAPE, output to teletype when accepting source tape number for ID fiche.

44. SRTAP. Variable buffer when source tape number is stored for ID fiche.

45. SVIND. Variable save address of buffer where teletype is to store information.

46. TABBUF. Variable buffer of 120 words where the transpose intensities are stored.

47. TABINT. Constant table of 64 words use to transpose intensity.

48. TITINT. Constant (4) which is title output intensity.

49. TITPT. Variable pointer to output teletype buffer, TITTY.

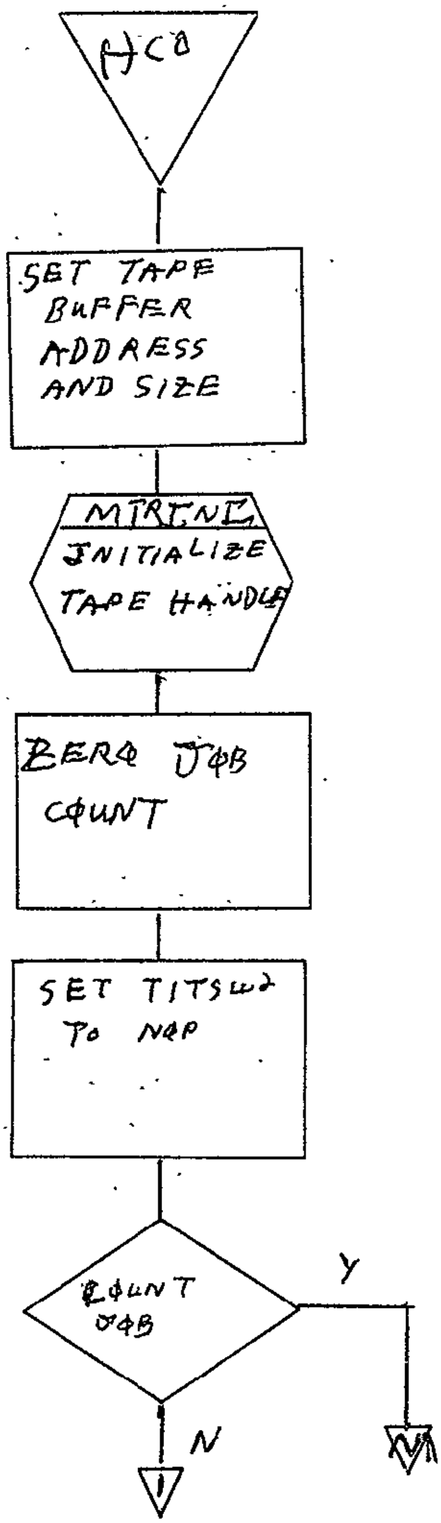
50. TITRCT. Variable number of titles to skip before starting to process fiche.

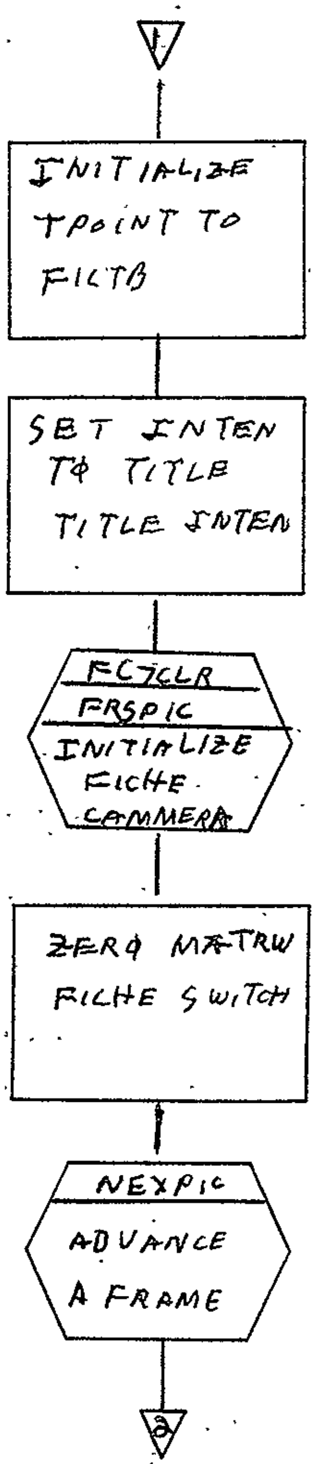
51. TITTY. Variable buffer where title information is stored for teletype output.

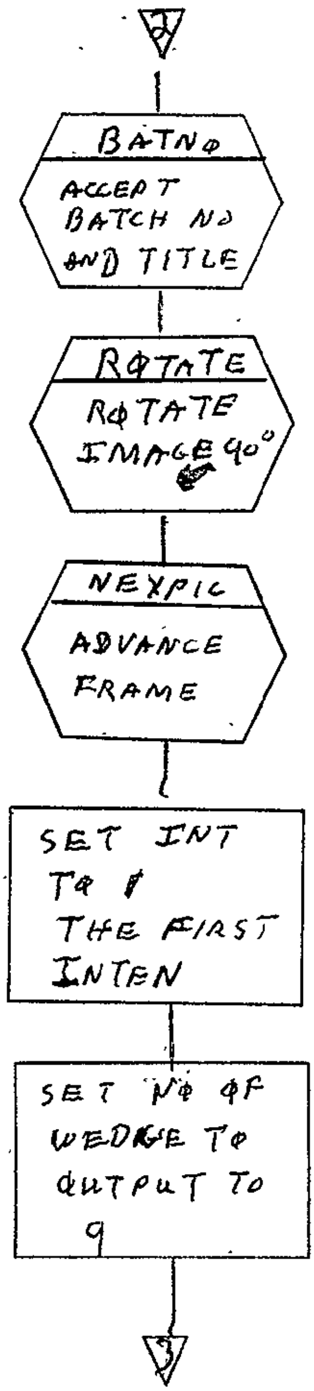
52. TMPCT. Variable temporary storage and count.

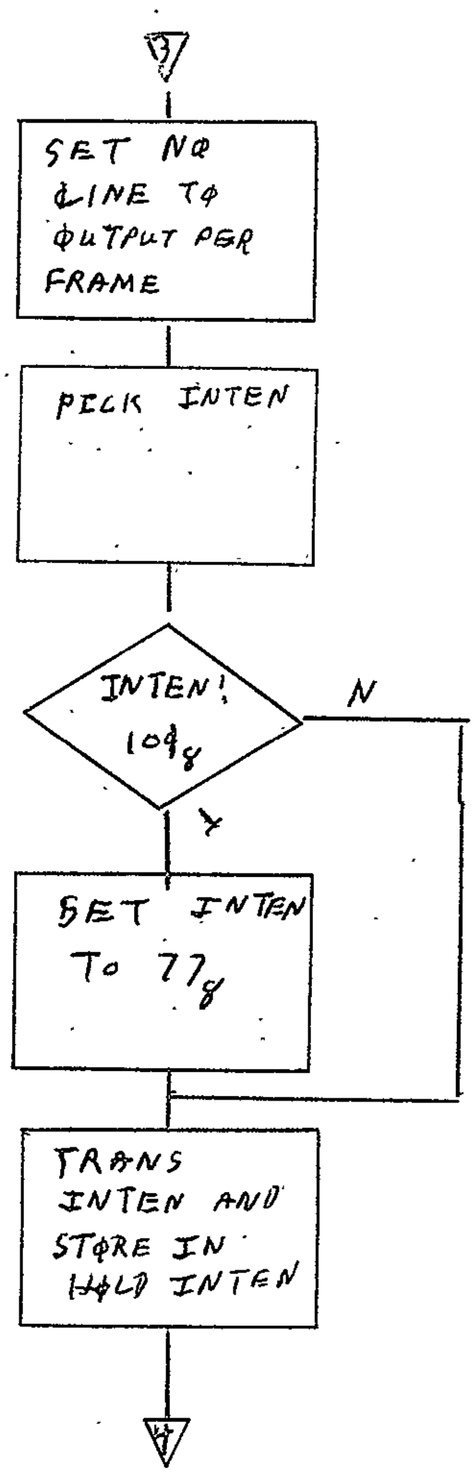
53. TIINFO. Variable buffer where BEGIN or END is stored for ID fiche.

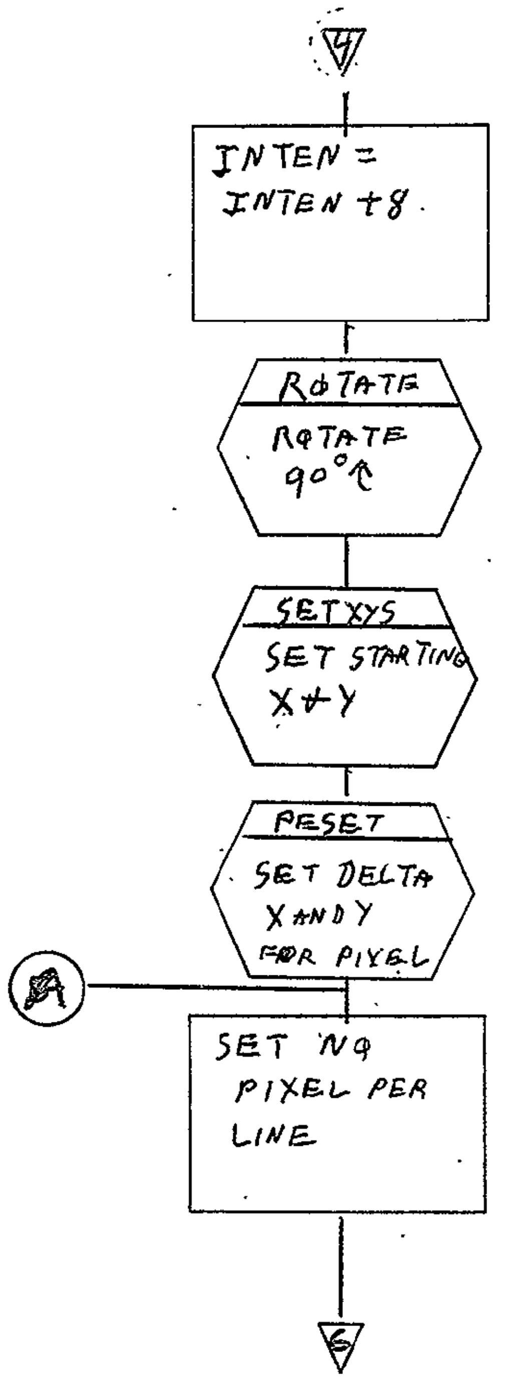
2.10.3.4 Flow Charts. See following pages.

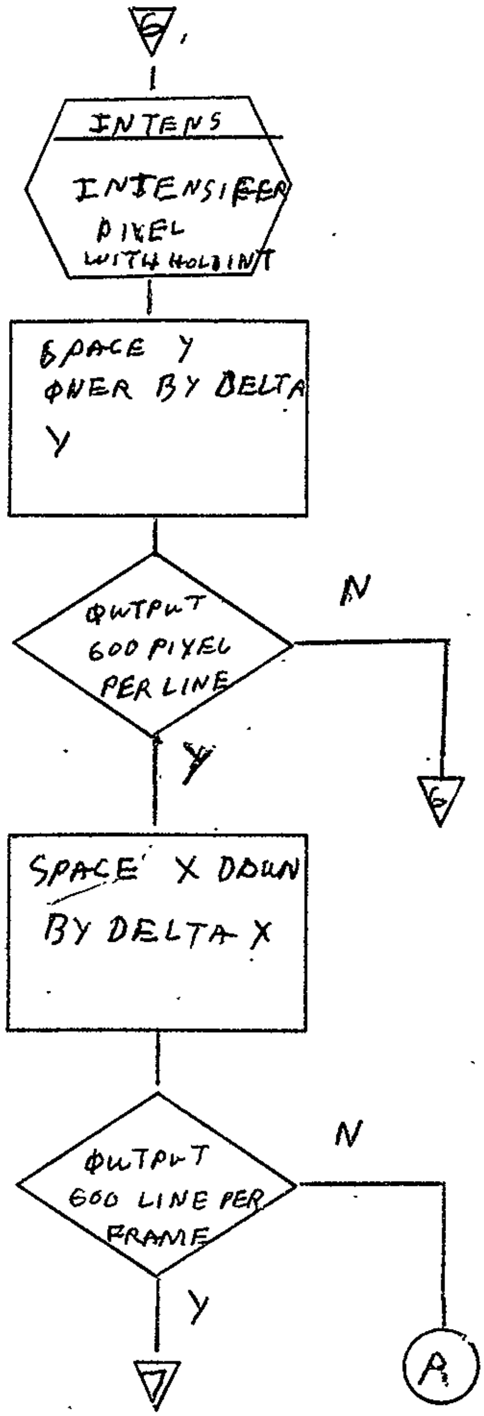

HC0
SET TAPE BUFFER ADDRESS AND SIZE
MTRCNG
INITIALIZE TAPE HANDLER
ZERO JOB COUNT
SET TITSW2 TO NOP
COUNT JOB
Y
N
1

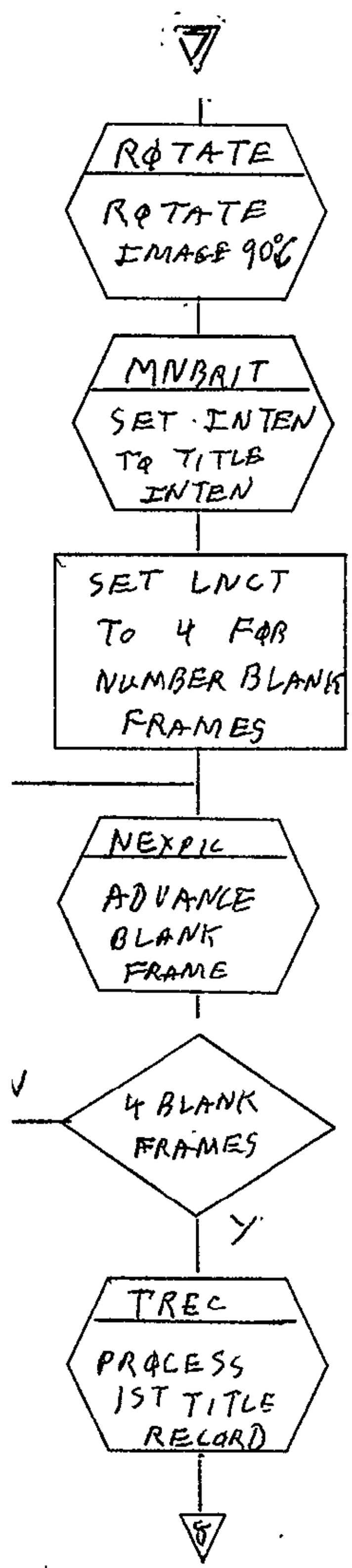

1
INITIALIZE
TPOINT TO
FILTB
SET INTEN
TO TITLE
TITLE INTEN
FCYCLR
FRSPIC
INITIALIZE
FICHE
CAMMERA
ZERO MATRW
FICHE SWITCH
NEXPIC
ADVANCE
A FRAME
2

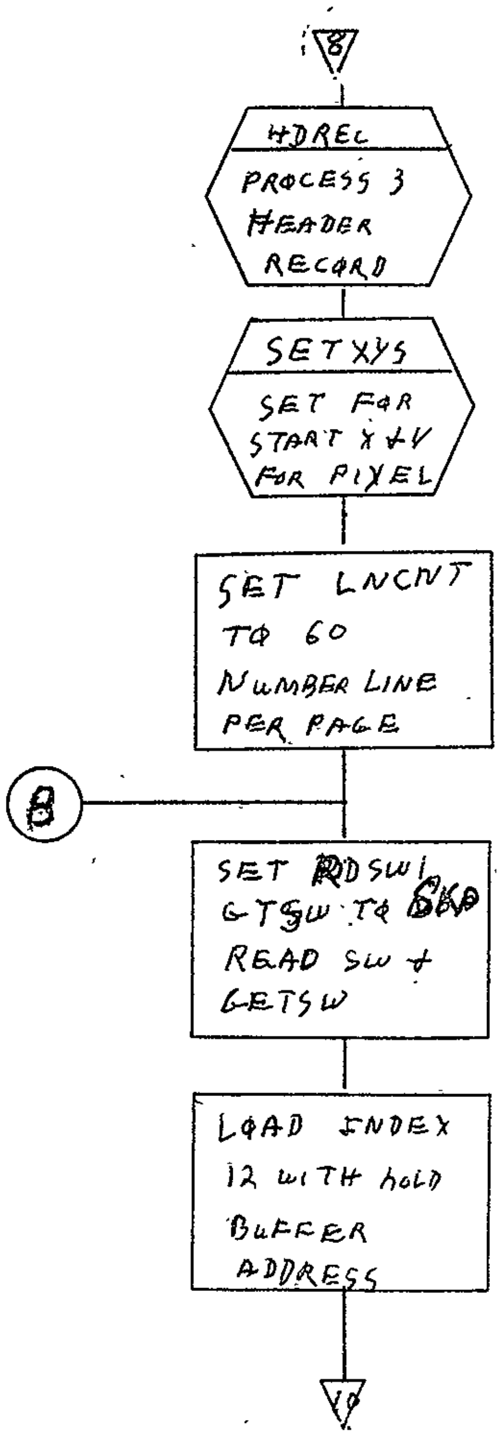

2
BATNO
ACCEPT BATCH NO AND TITLE
ROTATE
ROTATE IMAGE 90°
NEXPIC
ADVANCE FRAME
SET INT TO THE FIRST INTEN
SET NO OF WEDGE TO OUTPUT TO 9
3

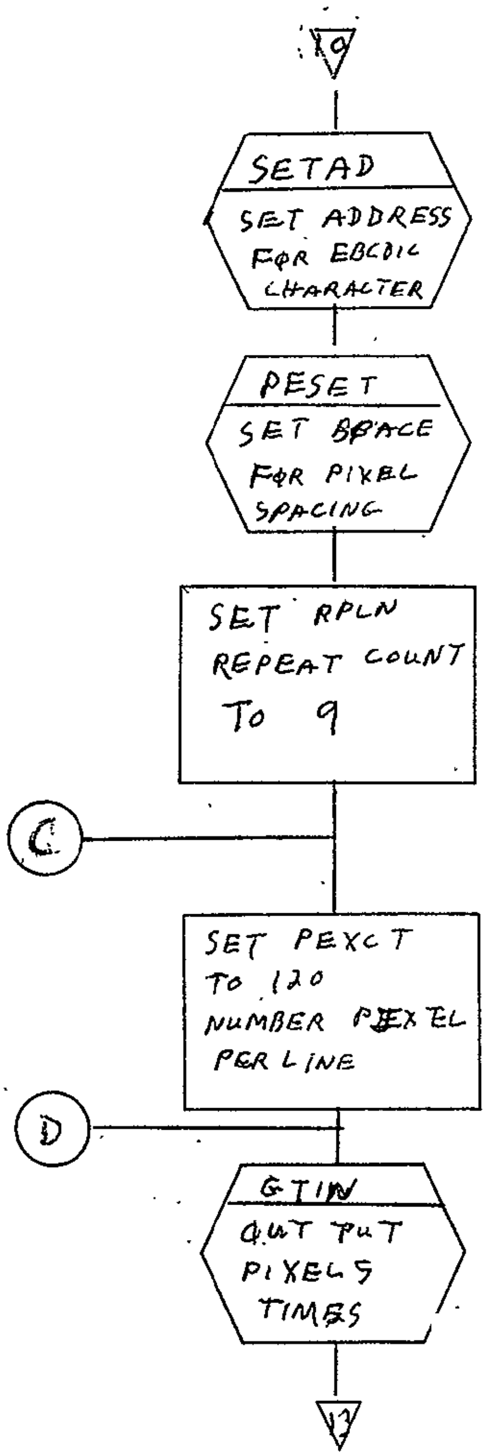

3
SET NO LINE TO OUTPUT PER FRAME
PICK INTEN
INTEN : 10$_8$
N
Y
SET INTEN TO 77$_8$
TRANS INTEN AND STORE IN HOLD INTEN
4

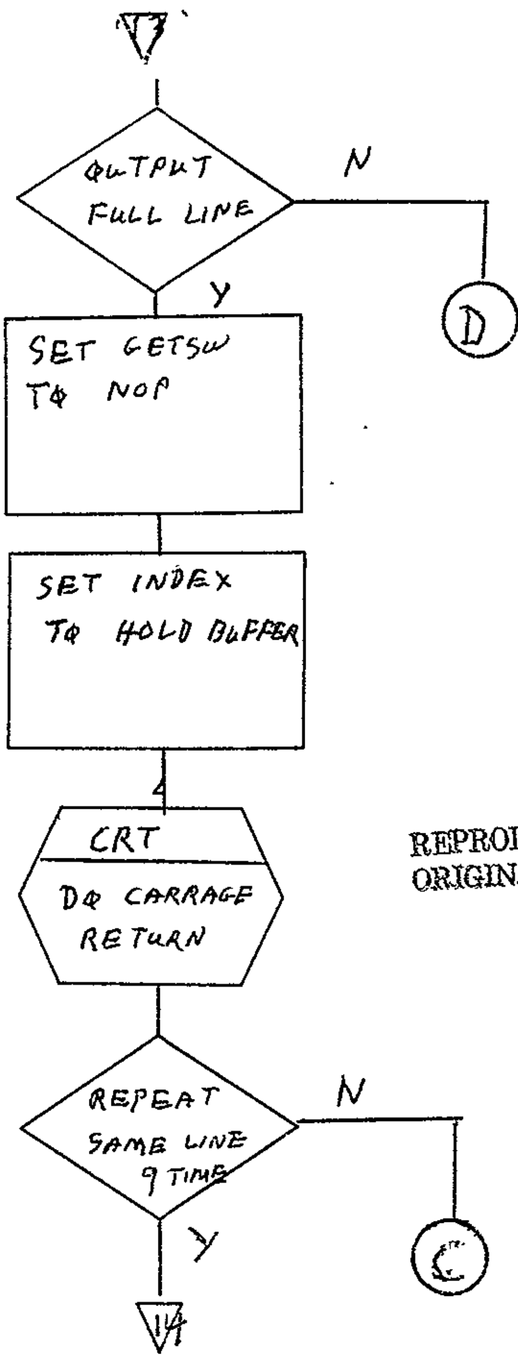

4
INTEN = INTEN +8.
ROTATE
ROTATE 90°
SETXYS
SET STARTING X+Y
RESET
SET DELTA X AND Y FOR PIXEL
A
SET NO PIXEL PER LINE
6

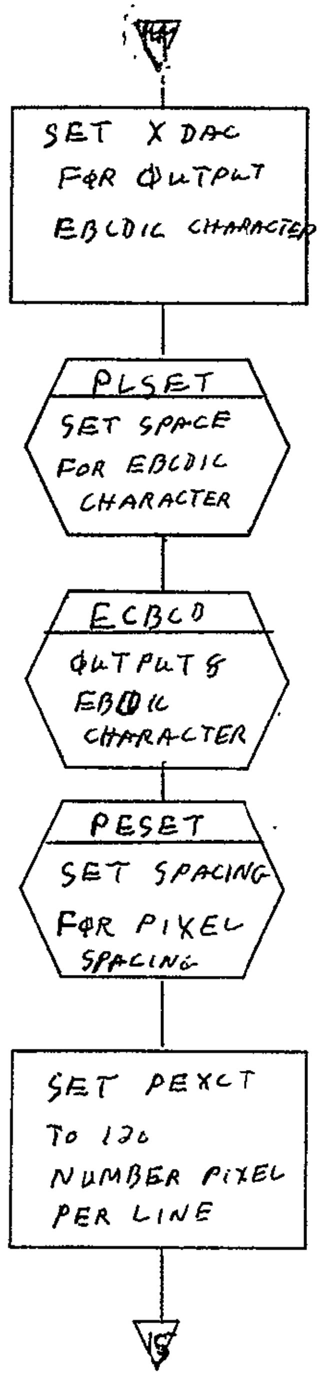

6
INTENS
INTENSIFER PIXEL WITH HOLDINT
SPACE Y OVER BY DELTA Y
OUTPUT 600 PIXEL PER LINE
N
Y
6
SPACE X DOWN BY DELTA X
OUTPUT 600 LINE PER FRAME
N
Y
7
A

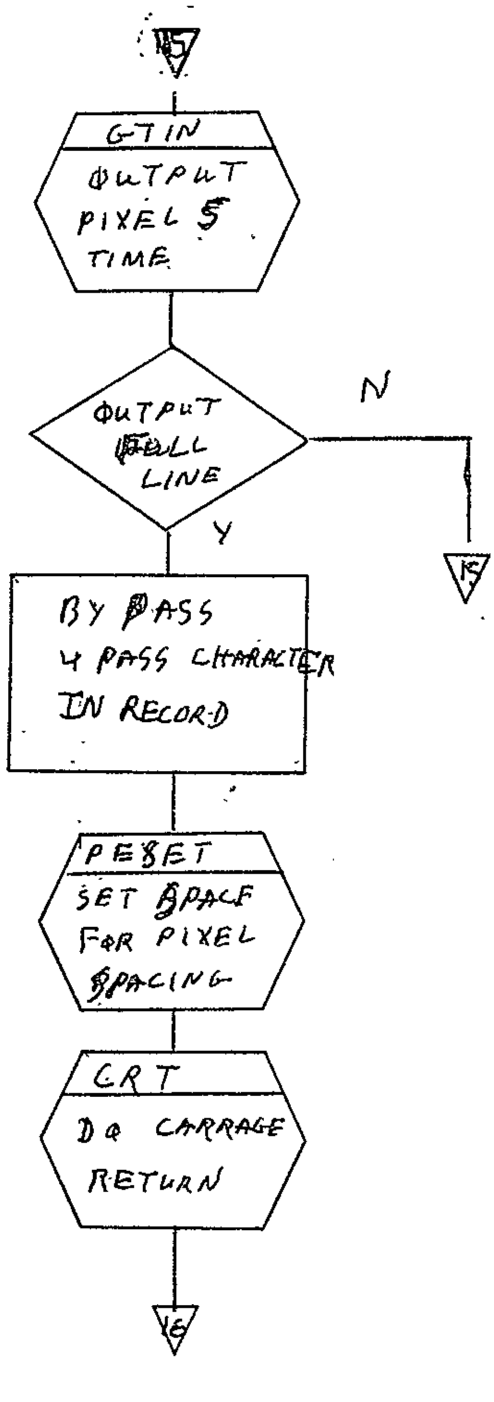

7
ROTATE
ROTATE IMAGE 90°C
MNBRIT
SET INTEN TO TITLE INTEN
SET LNCT TO 4 FOR NUMBER BLANK FRAMES
NEXPIC
ADVANCE BLANK FRAME
N
4 BLANK FRAMES
Y
TREC
PROCESS 1ST TITLE RECORD
8

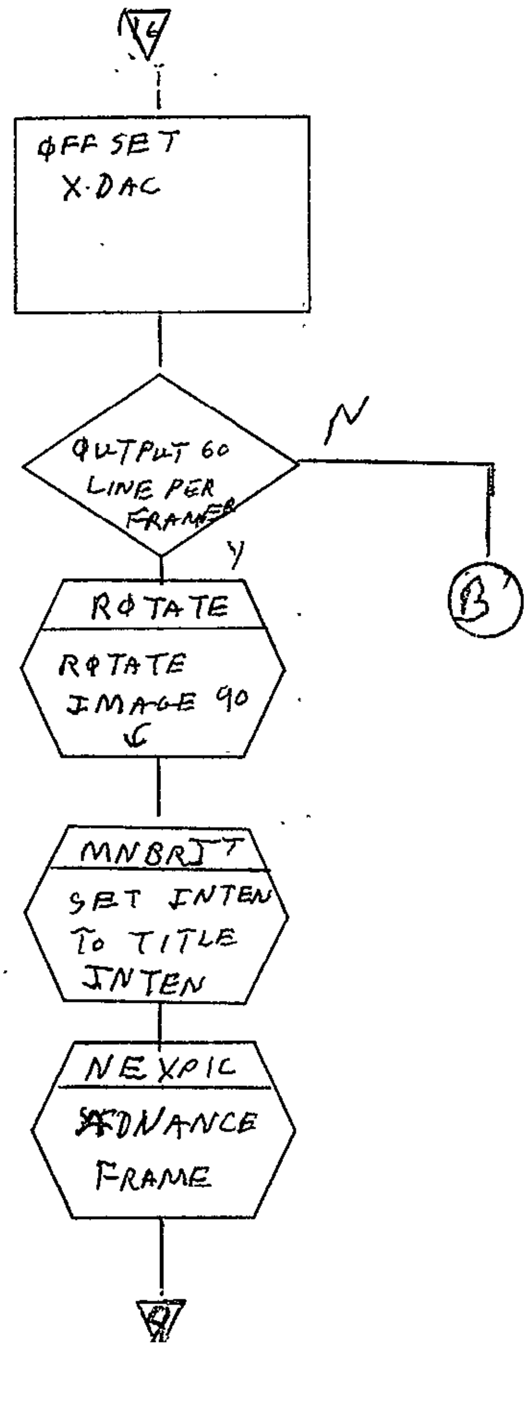

8
HDREL
PROCESS 3 HEADER RECORD
SETXYS
SET FOR START X+Y FOR PIXEL
SET LNCNT TO 60 NUMBER LINE PER PAGE
B
SET RDSWI GTSW TO
READ SW + GETSW
LOAD INDEX 12 WITH hold BUFFER ADDRESS
10

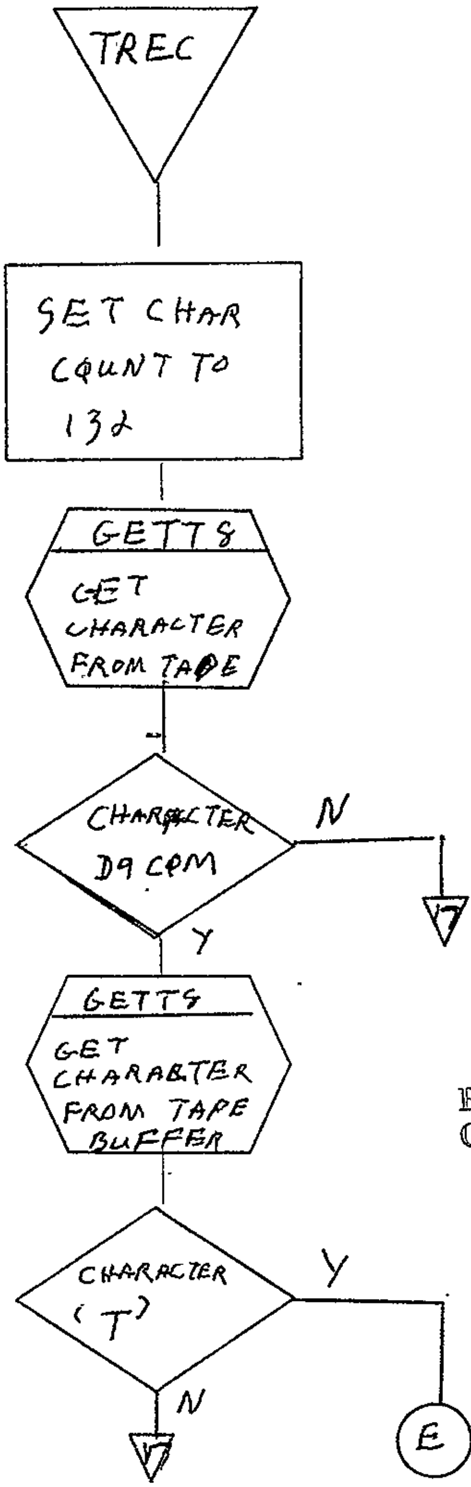

10
SETAD
SET ADDRESS FOR EBCDIC CHARACTER
PESET
SET SPACE FOR PIXEL SPACING
SET RPLN REPEAT COUNT TO 9
C
SET PEXCT TO 120 NUMBER PIXEL PER LINE
D
GTIN
OUT PUT PIXELS TIMES
13

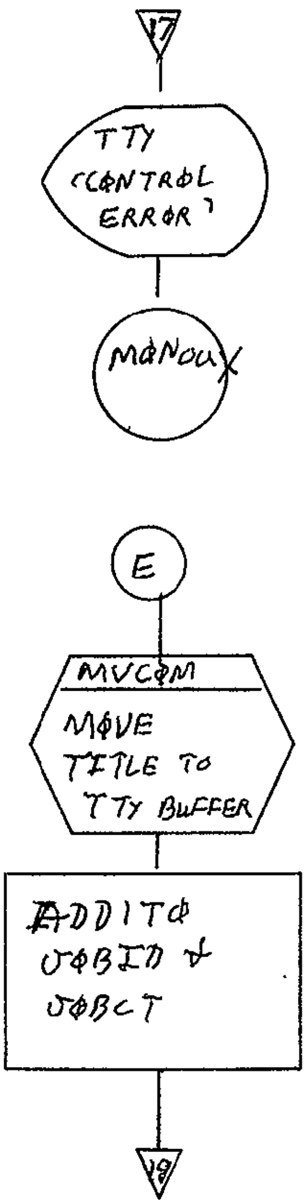

13
OUTPUT FULL LINE
N
Y
D
SET GETSW TO NOP
SET INDEX TO HOLD BUFFER
4
CRT
DO CARRAGE RETURN
REPEAT SAME LINE 9 TIMES
N
Y
C
14

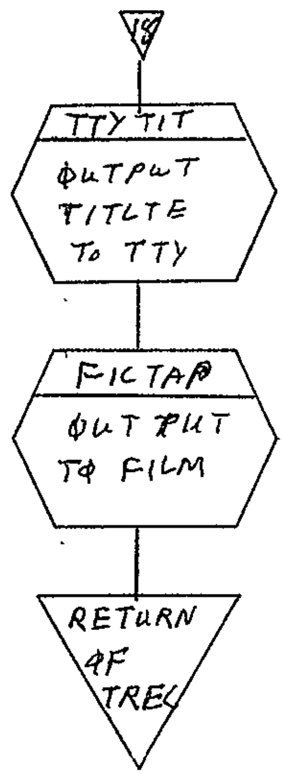

14
SET X DAC FOR OUTPUT EBCDIC CHARACTER
PLSET
SET SPACE FOR EBCDIC CHARACTER
ECBCD
OUTPUT 8 EBCDIC CHARACTER
PESET
SET SPACING FOR PIXEL SPACING
SET PEXCT TO 120 NUMBER PIXEL PER LINE
15

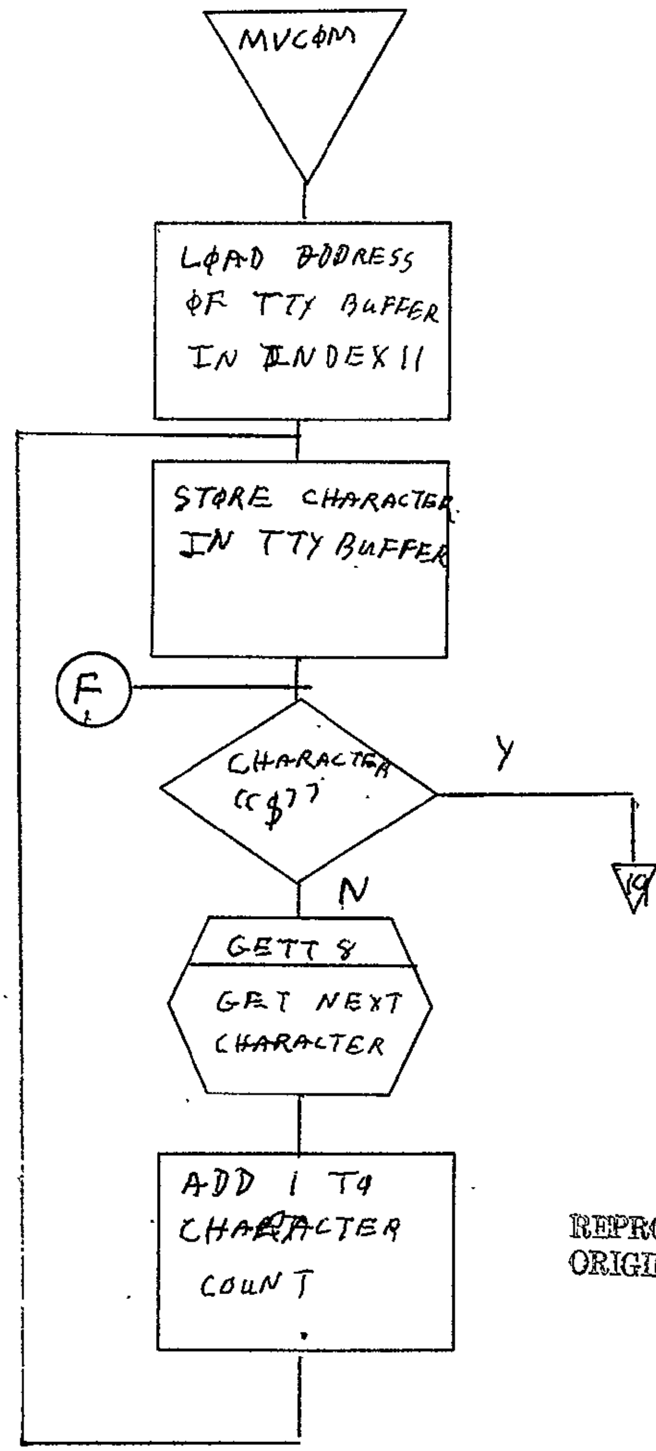

15
GTIN
OUTPUT PIXEL 5 TIME
OUTPUT FULL LINE
N
15
Y
BY PASS 4 PASS CHARACTER IN RECORD
PESET
SET SPACE FOR PIXEL SPACING
CRT
DO CARRAGE RETURN
16

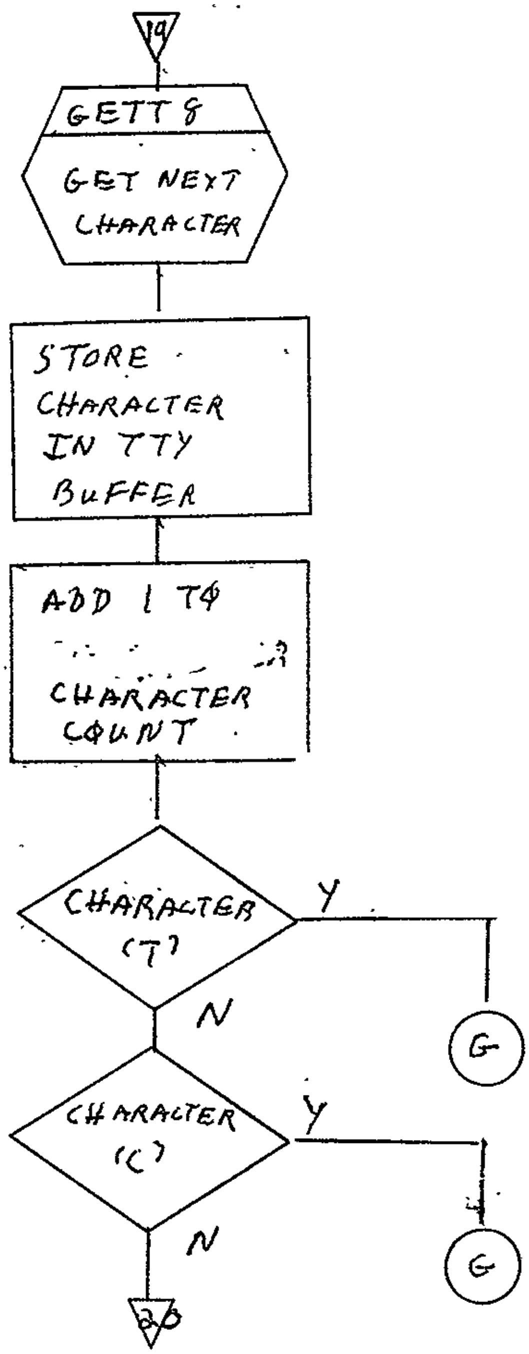

OFFSET
X-DAC
OUTPUT 60
LINE PER
FRAME
N
Y
B
ROTATE
ROTATE
IMAGE 90
MNBRIT
SET INTEN
TO TITLE
INTEN
NEXPIC
ADVANCE
FRAME

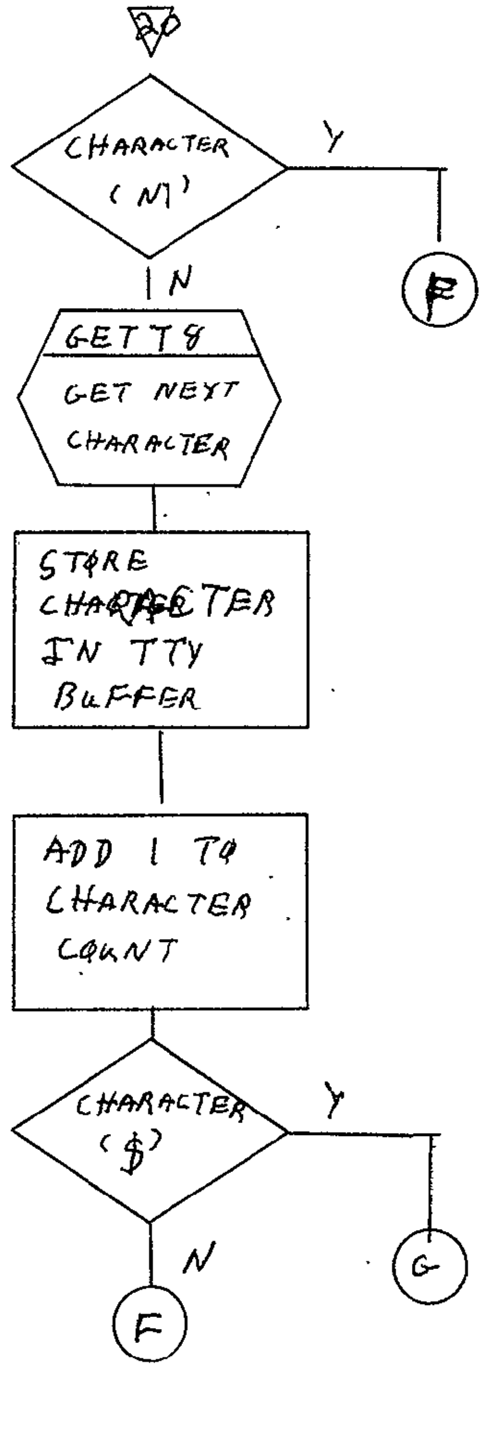

TREC
SET CHAR COUNT TO 132
GETTS
GET CHARACTER FROM TAPE
CHARACTER D9 CPM
N
Y
GETTS
GET CHARABTER FROM TAPE BUFFER
CHARACTER 'T'
Y
N
E

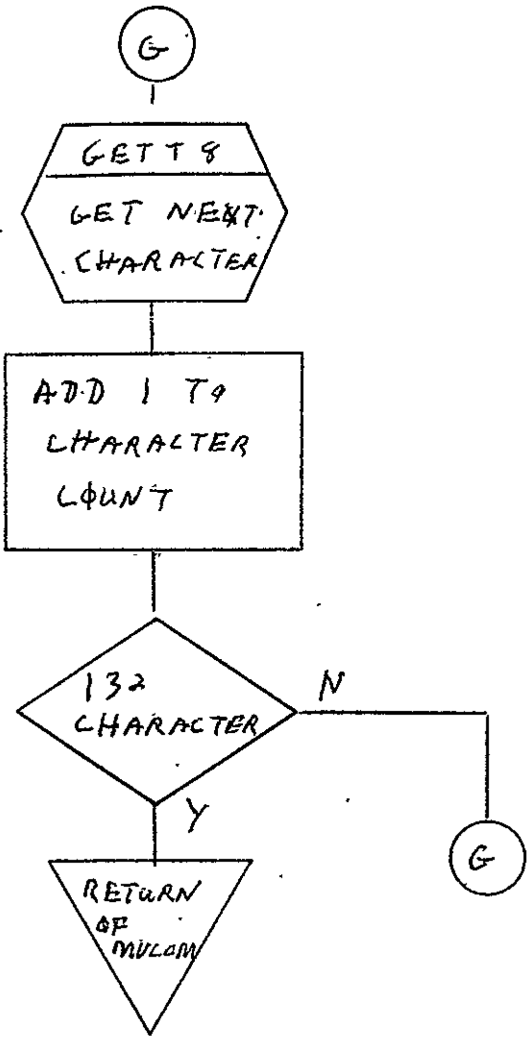

17
TTY
CONTROL
ERROR
MONOUX
E
MVCOM
MOVE
TITLE TO
TTY BUFFER
ADDITO
JOBID &
JOBCT
19

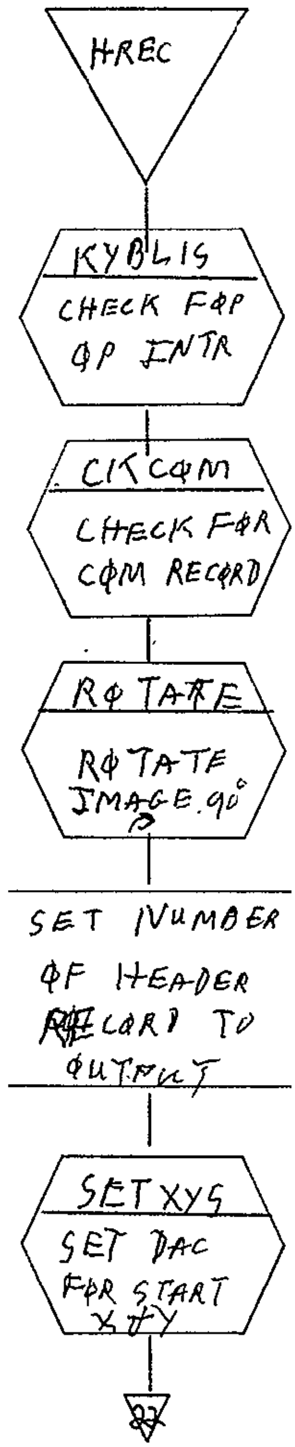

18
TTYTIT
ΦUTPUT
TITLTE
To TTY
FICTAP
ΦUTPUT
TΦ FILM
RETURN
ΦF
TREC

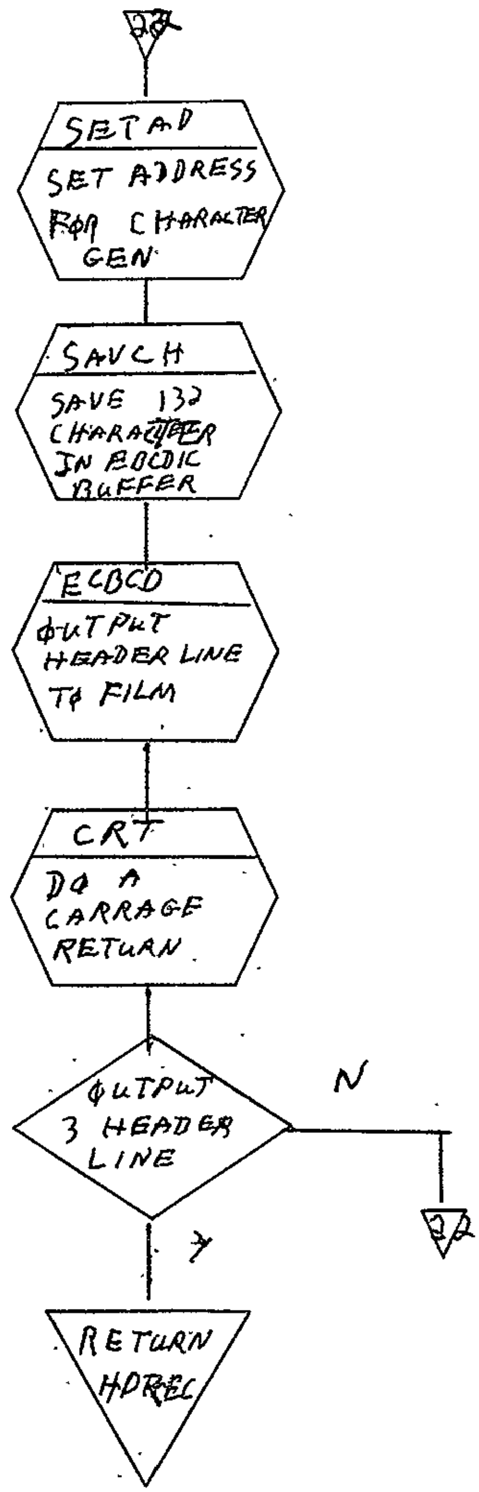

MVCØM
LØAD ADDRESS ØF TTY BUFFER IN INDEX 11
STØRE CHARACTER IN TTY BUFFER
F
CHARACTER "$"?
Y
19
N
GETT8
GET NEXT CHARACTER
ADD 1 TØ CHARACTER COUNT

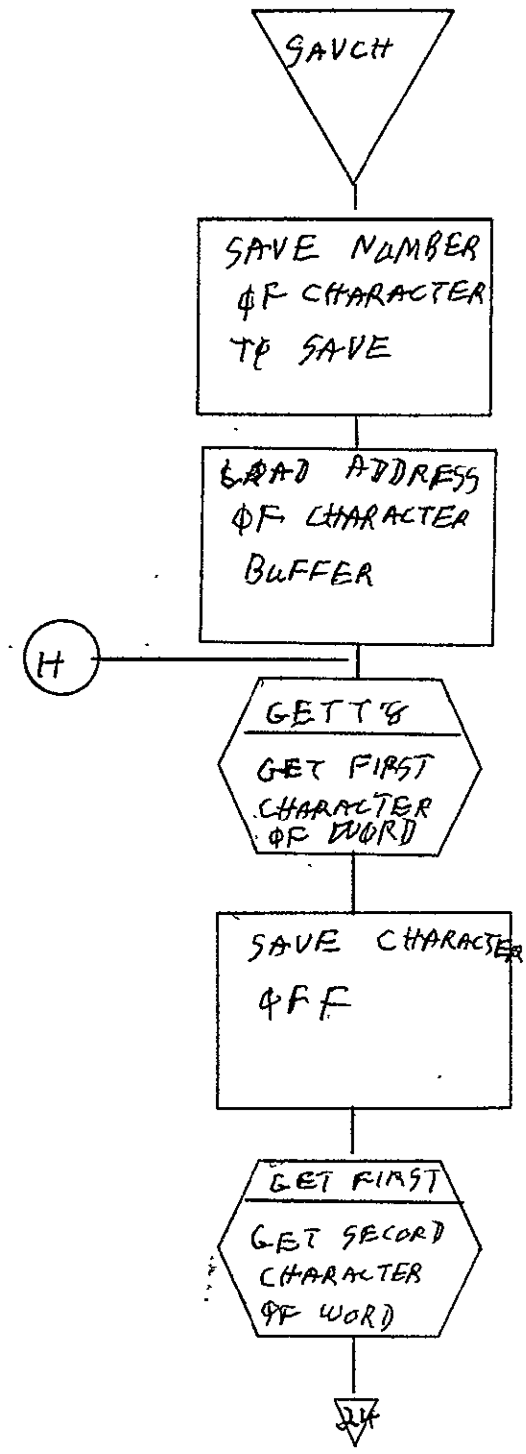

19
GETT8
GET NEXT CHARACTER
STORE CHARACTER IN TTY BUFFER
ADD 1 TO
CHARACTER COUNT
CHARACTER (T?
Y
N
G
CHARACTER (C?
Y
N
G
20

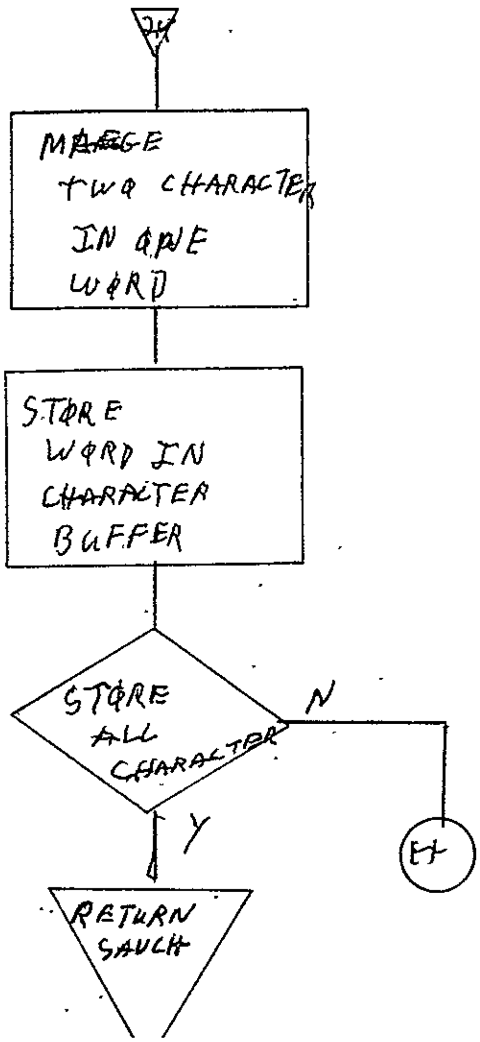

20
CHARACTER (M)
Y
N
F
GETT8
GET NEXT CHARACTER
STORE CHARACTER IN TTY BUFFER
ADD 1 TO CHARACTER COUNT
CHARACTER ($)
Y
N
F
G

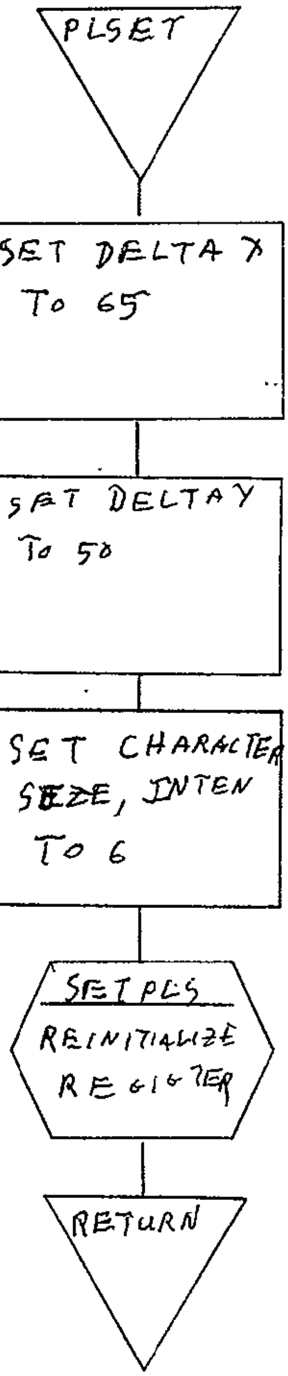

G
GETT8
GET NEXT CHARACTER
ADD 1 TO CHARACTER COUNT
132 CHARACTER
N
Y
RETURN OF MULCOM
G

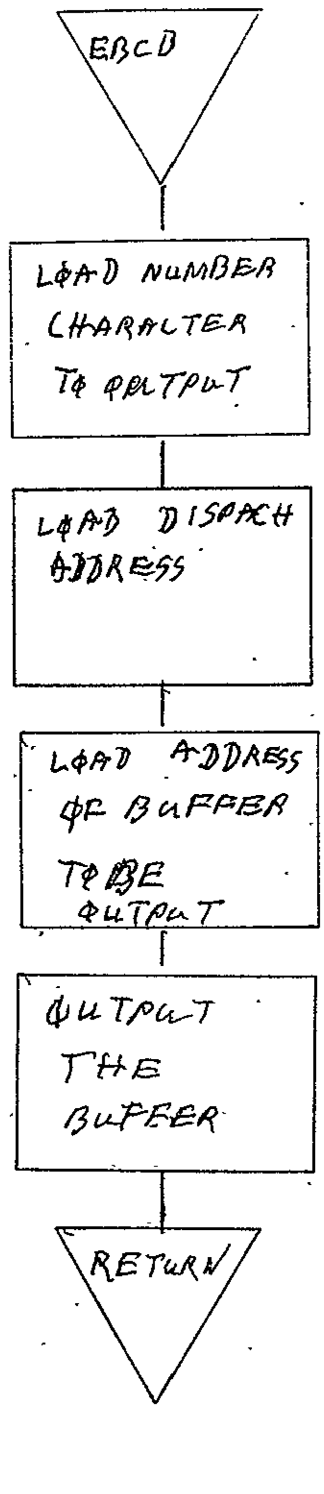

HREC
KYBLIS
CHECK FOR OP INTR
CKCOM
CHECK FOR COM RECORD
ROTATE
ROTATE IMAGE 90°
SET NUMBER OF HEADER RECORD TO OUTPUT
SETXYS
SET DAC FOR START X+Y

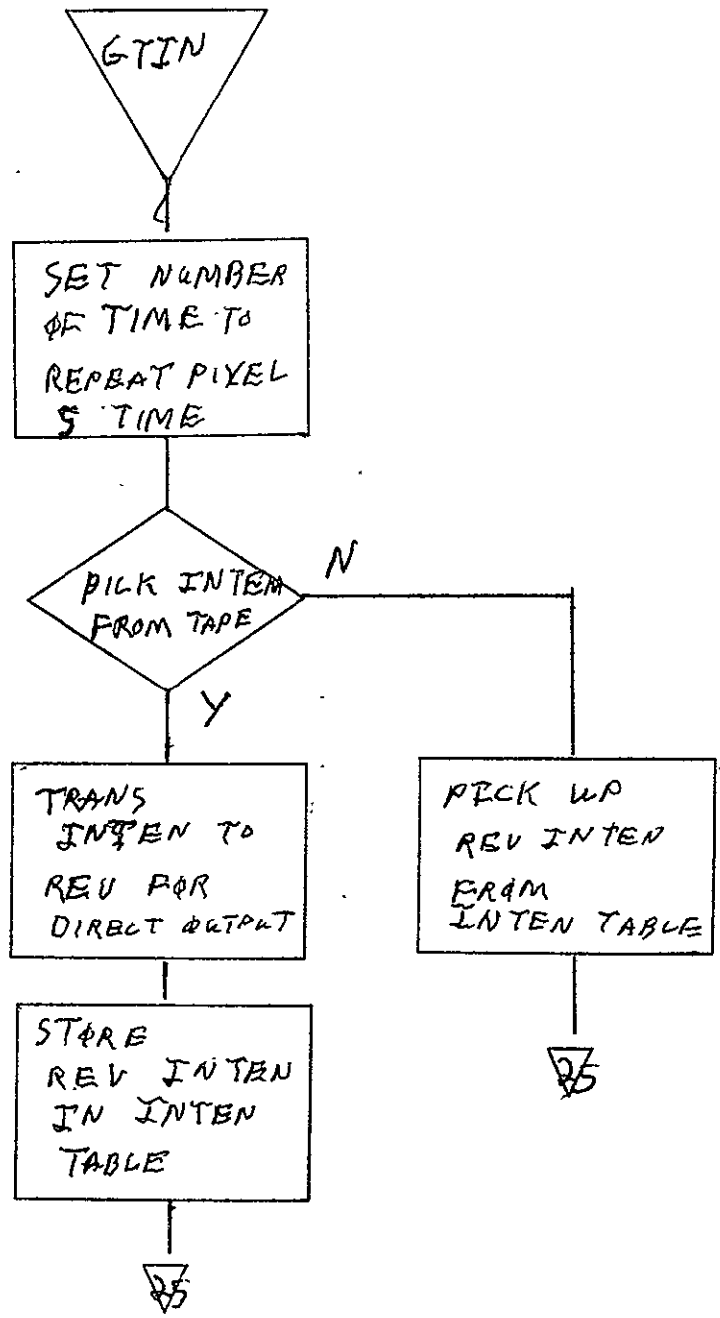

22
SETAD
SET ADDRESS FOR CHARACTER GEN
SAVCH
SAVE 132 CHARACTER IN EBCDIC BUFFER
ECBCD
OUTPUT HEADER LINE TO FILM
CRT
DO A CARRAGE RETURN
OUTPUT 3 HEADER LINE
N
22
Y
RETURN HDREC

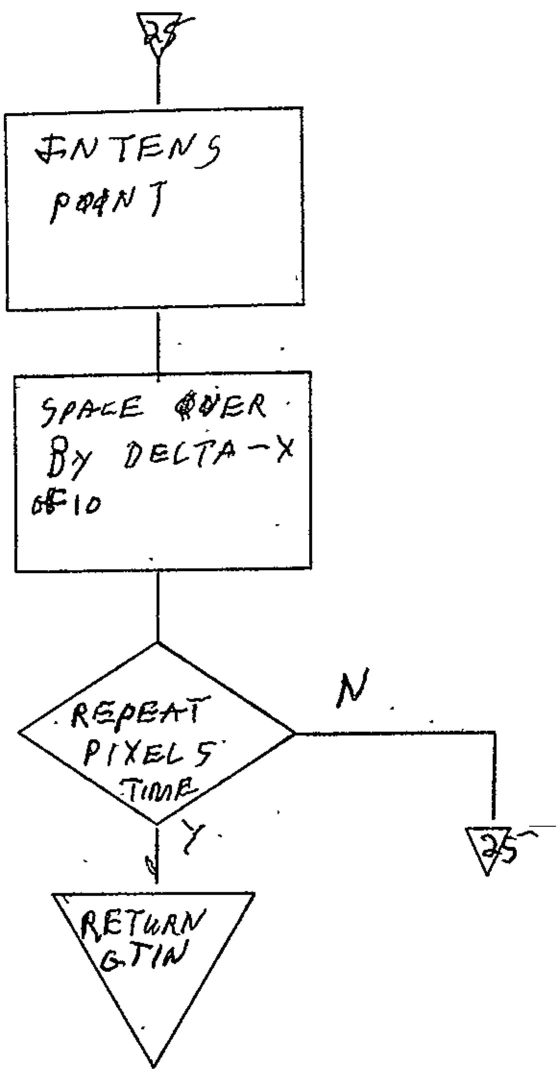

SAVCH
SAVE NUMBER ΦF CHARACTER TΦ SAVE
LOAD ADDRESS ΦF CHARACTER BUFFER
H
GETT8
GET FIRST CHARACTER ΦF WORD
SAVE CHARACTER ΦFF
GET FIRST
GET SECOND CHARACTER ΦF WORD
24

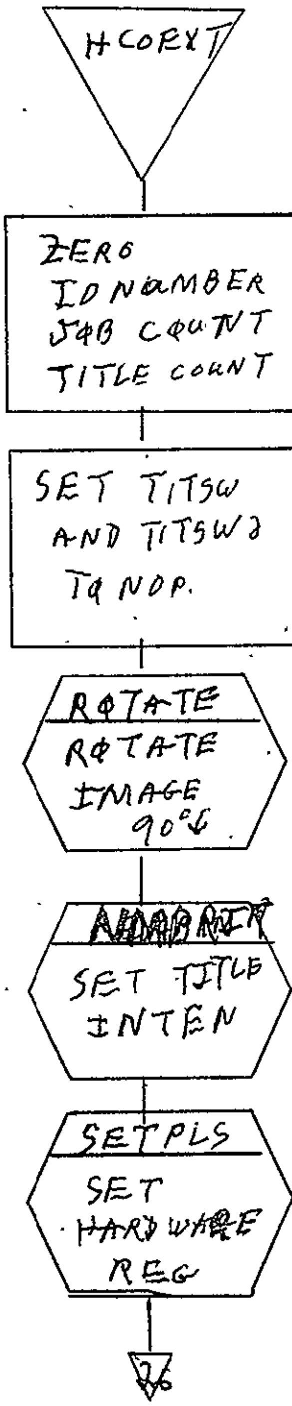

MERGE TWO CHARACTER IN ONE WORD
STORE WORD IN CHARACTER BUFFER
STORE ALL CHARACTER
N
Y
RETURN SAUCH

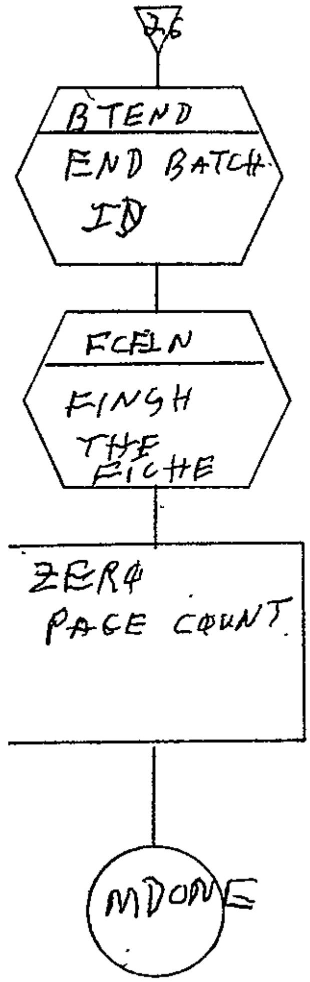

PLSET
SET DELTA X TO 65
SET DELTA Y TO 50
SET CHARACTER SIZE, INTEN TO 6
SETPLS
REINITIALIZE REGISTER
RETURN

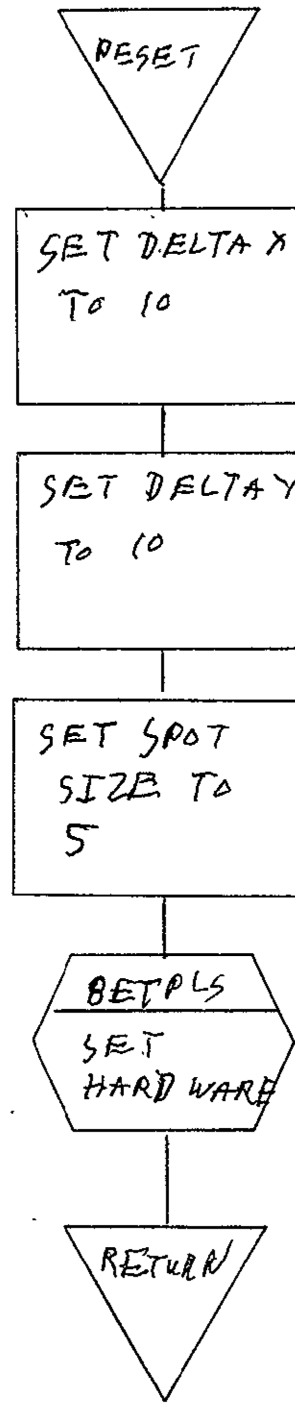

EBCD
LOAD NUMBER CHARACTER TO OUTPUT
LOAD DISPACH ADDRESS
LOAD ADDRESS OF BUFFER TO BE OUTPUT
OUTPUT THE BUFFER
RETURN

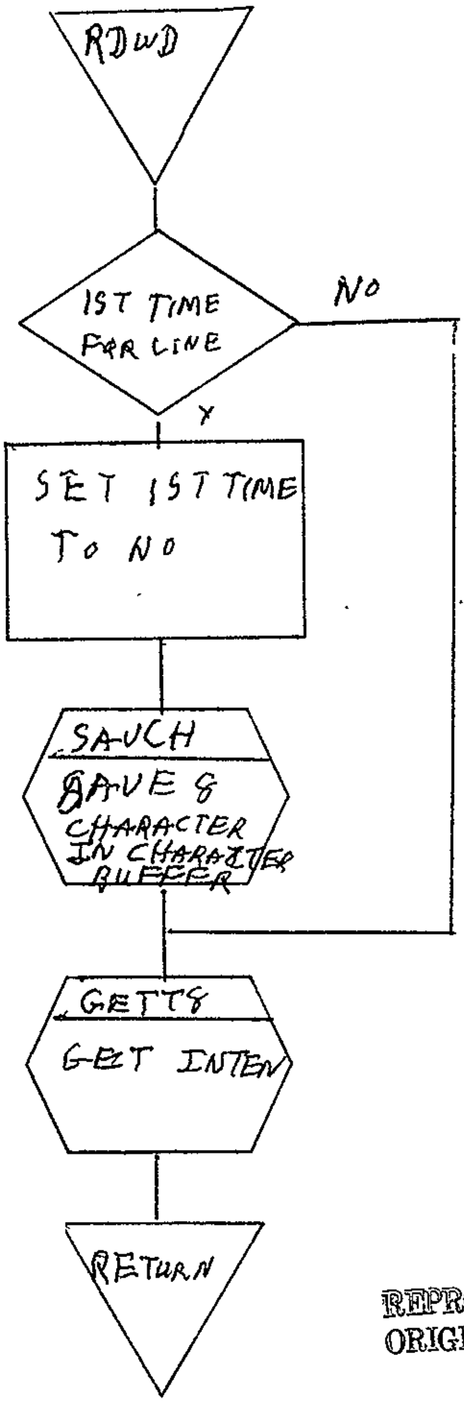

GTIN
SET NUMBER OF TIME TO REPEAT PIXEL 5 TIME
PICK INTEN FROM TAPE
N
Y
TRANS INTEN TO REV FOR DIRECT OUTPUT
STORE REV INTEN IN INTEN TABLE
PICK UP REV INTEN FROM INTEN TABLE
25
25

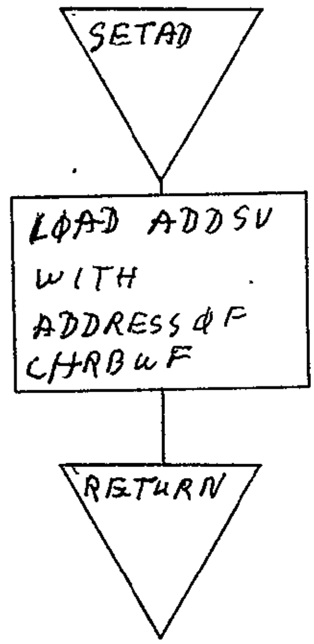

25
INTENS
POINT
SPACE OVER
BY DELTA-X
OF 10
REPEAT
PIXELS
TIME
N
Y
25
RETURN
GTIN

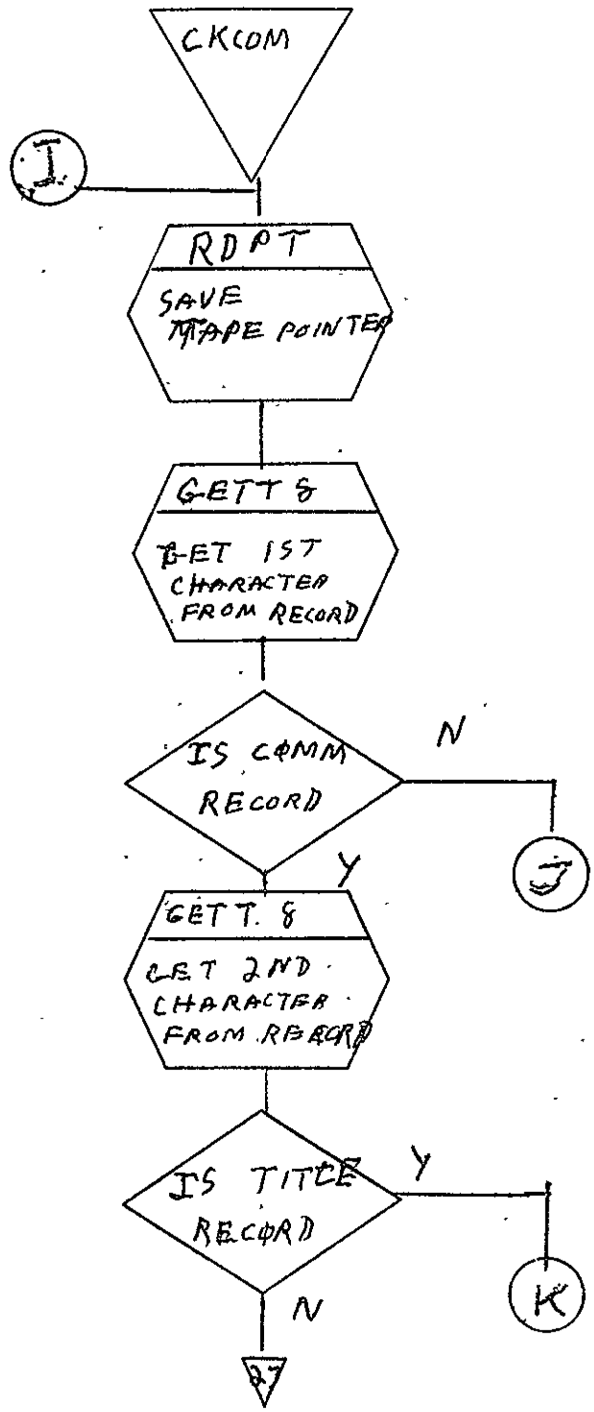

HCORXT
ZERO
ID NUMBER
JOB COUNT
TITLE COUNT
SET TITSW
AND TITSW2
TO NOP.
ROTATE
ROTATE
IMAGE
90°
SET TITLE
INTEN
SETPLS
SET
HARDWARE
REG

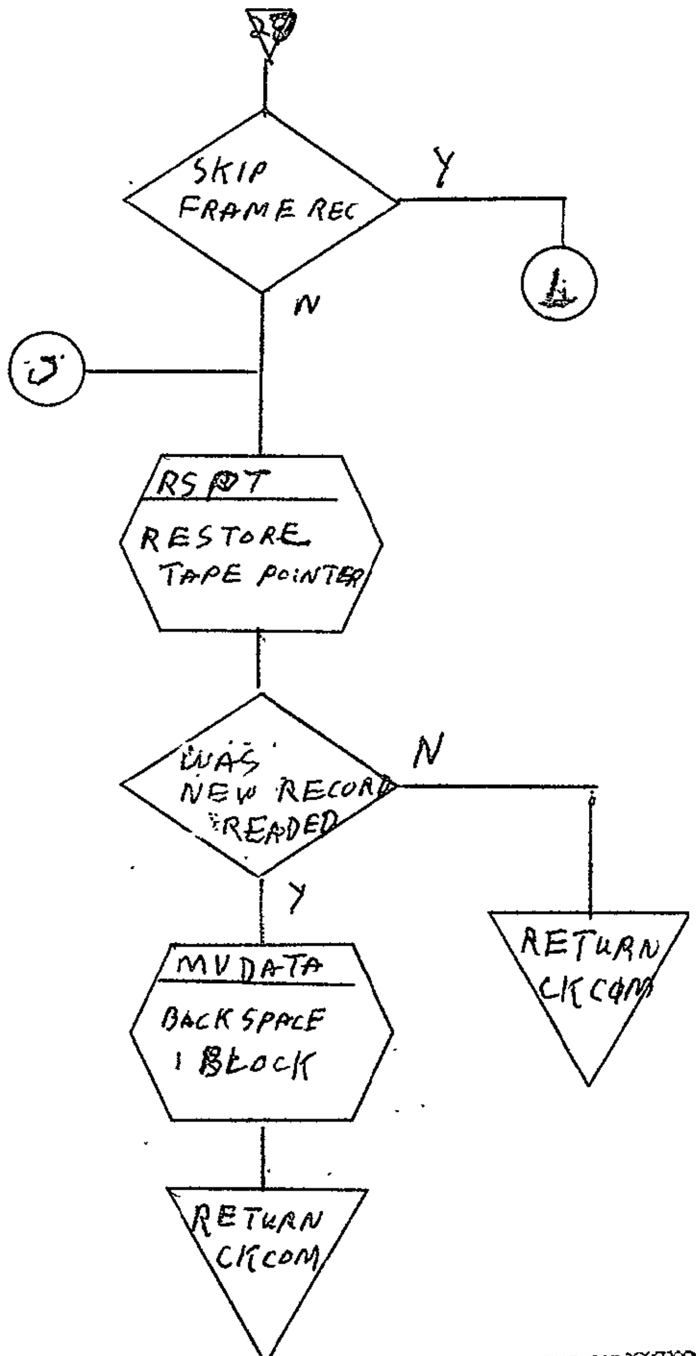

26
BTEND
END BATCH ID
FCELN
FINSH THE FICHE
ZERO PAGE COUNT
MDONE

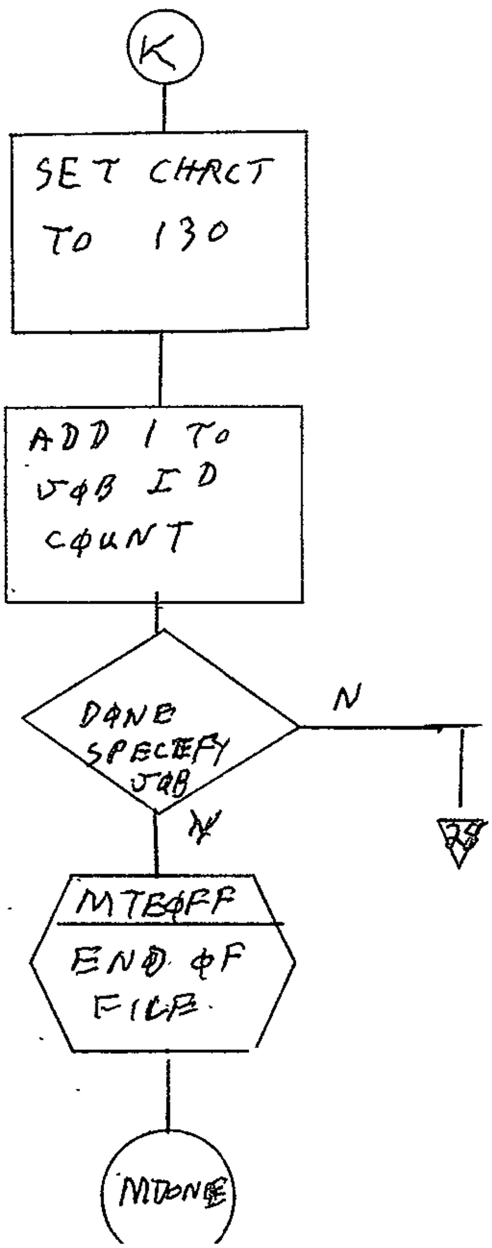

RESET
SET DELTA X TO 10
SET DELTA Y TO 10
SET SPOT SIZE TO 5
BETPLS
SET HARDWARE
RETURN

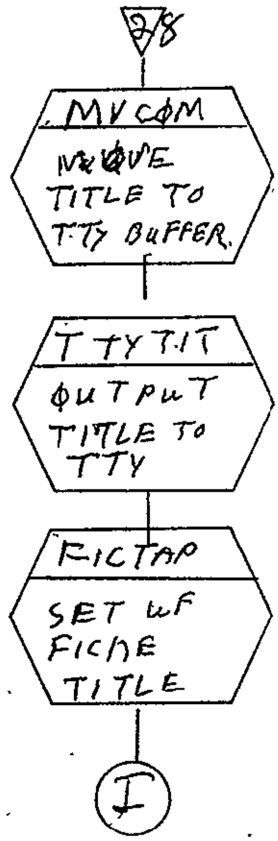

RDWD
1ST TIME FOR LINE
NO
Y
SET 1ST TIME TO NO
SAUCH
SAVE 8 CHARACTER IN CHARACTER BUFFER
GETT8
GET INTEN
RETURN

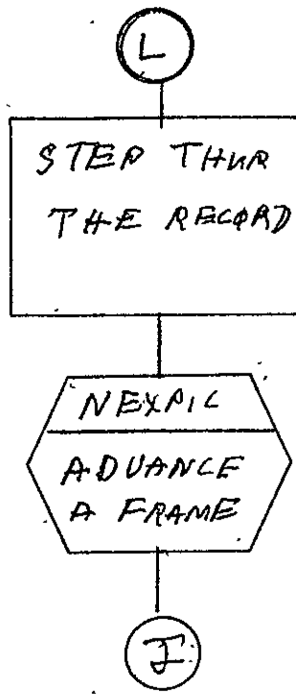

SETAD
LOAD ADDSV WITH ADDRESS OF CHRBUF
RETURN

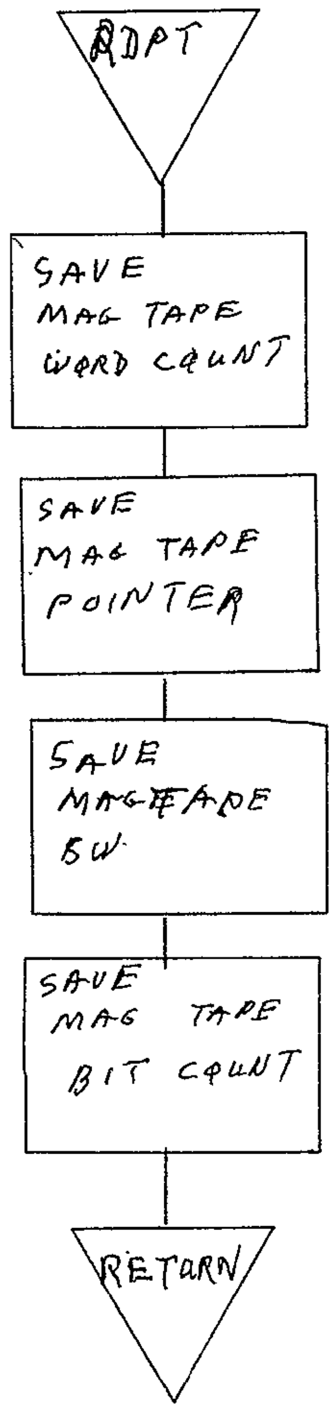

CKCOM
I
RDPT
SAVE TAPE POINTER
GETT 8
GET 1ST CHARACTER FROM RECORD
IS COMM RECORD
N
J
Y
GETT. 8
GET 2ND CHARACTER FROM RECORD
IS TITLE RECORD
Y
K
N
27

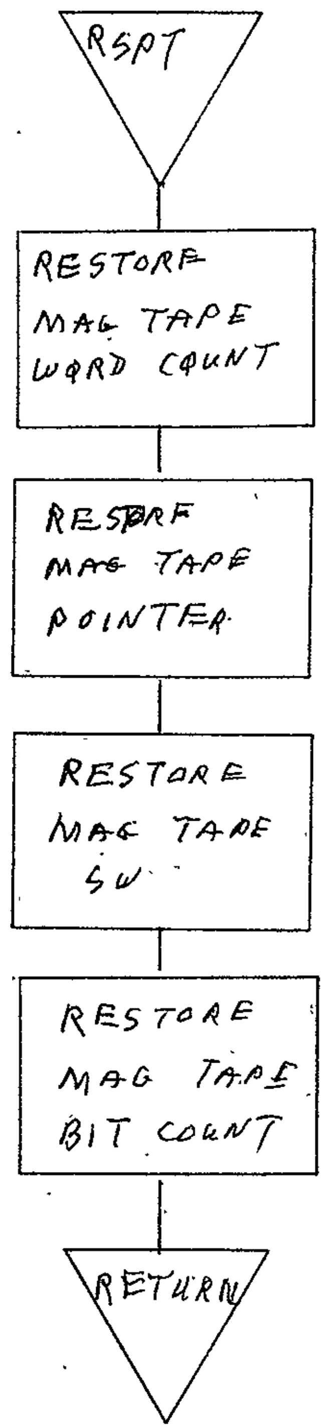

SKIP FRAME REC
Y
N
RSPT
RESTORE TAPE POINTER
WAS NEW RECORD READED
N
Y
MVDATA
BACK SPACE 1 BLOCK
RETURN CKCOM
RETURN CKCOM

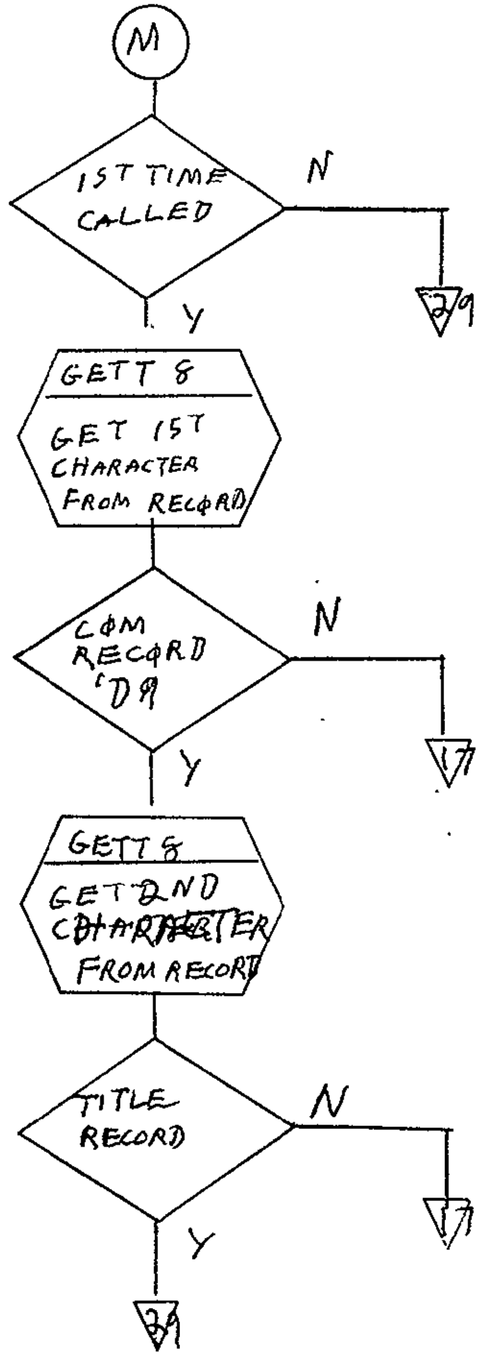

K
SET CHRCT TO 130
ADD 1 TO JOB ID COUNT
DONE SPECIFY JOB
N
Y
MTEOFF
END OF FILE
MDONE

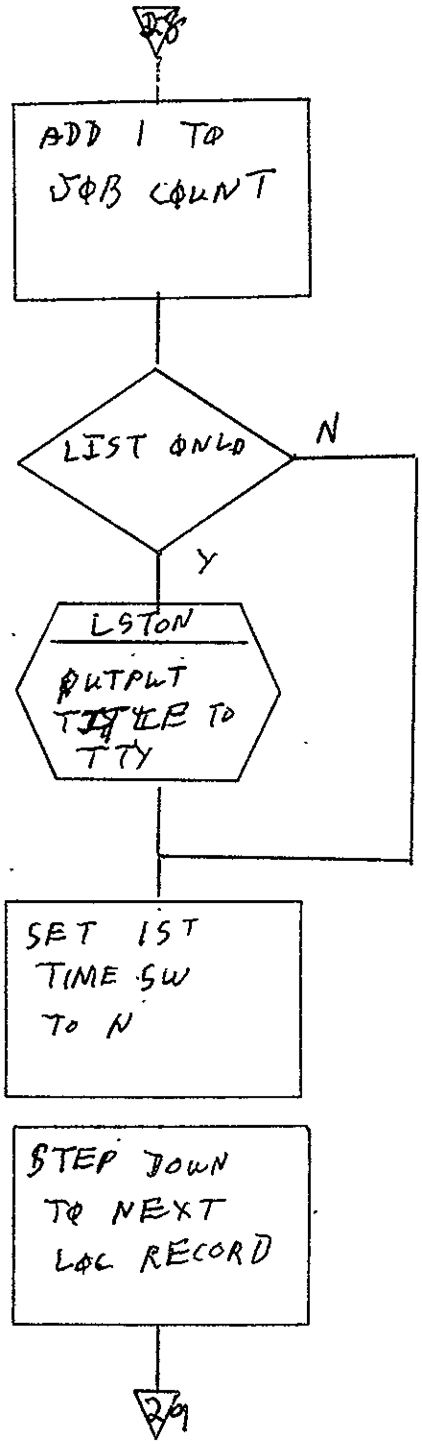

28
MVCØM
MØVE TITLE TO TTY BUFFER.
TTYTIT
ØUTPUT TITLE TO TTY
FICTAP
SET uF FICHE TITLE
I

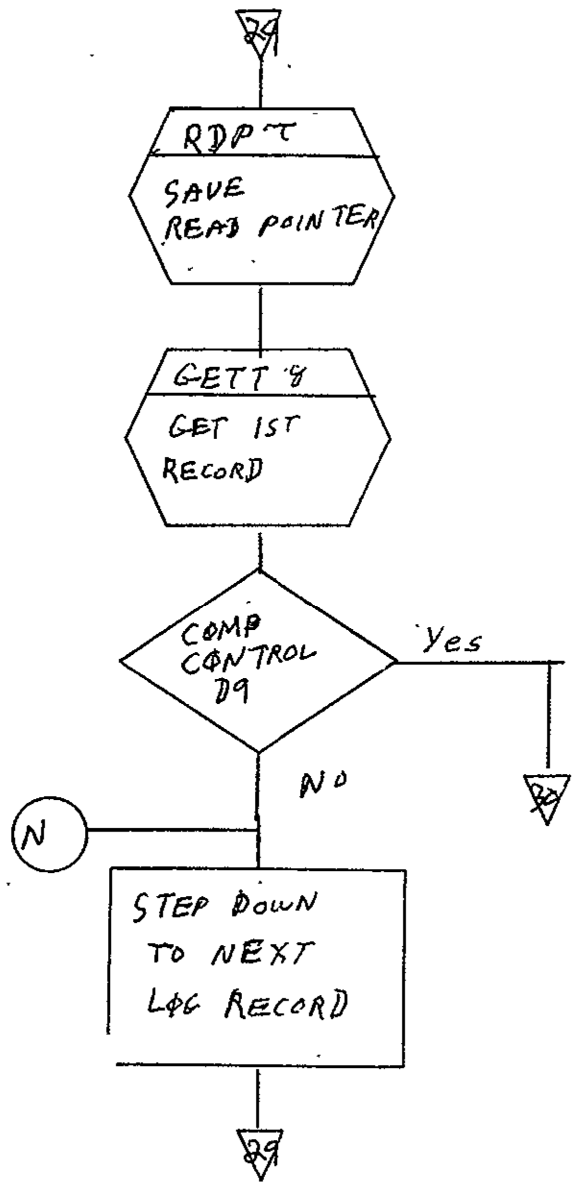

L
STEP THUR
THE RECORD
NEXPIC
ADVANCE
A FRAME
J

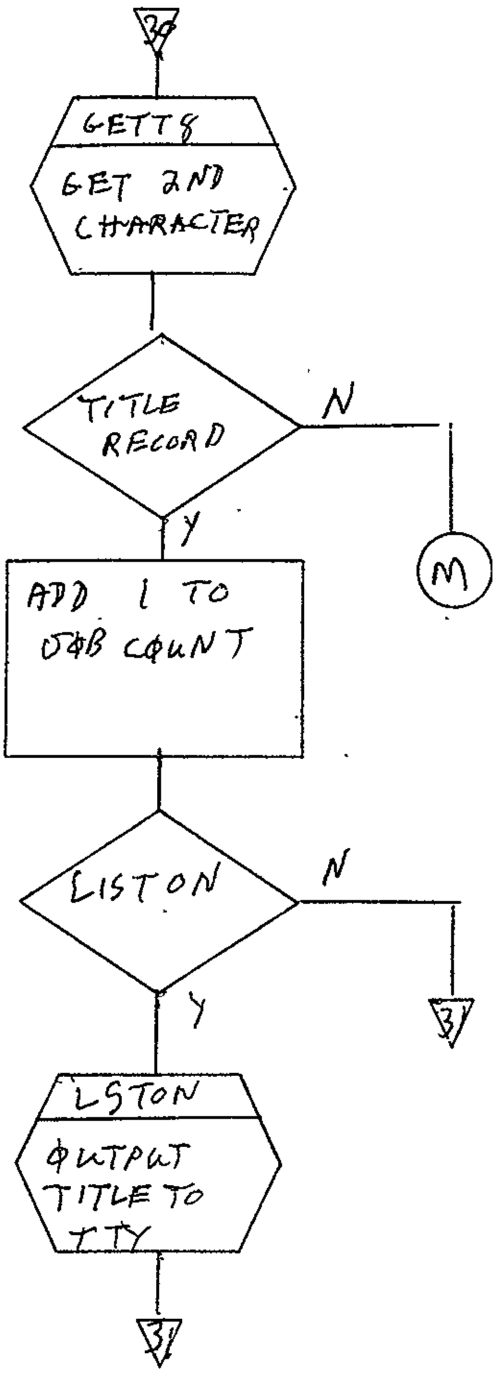

RDPT
SAVE
MAG TAPE
WORD COUNT
SAVE
MAG TAPE
POINTER
SAVE
MAGTAPE
BW
SAVE
MAG TAPE
BIT COUNT
RETURN

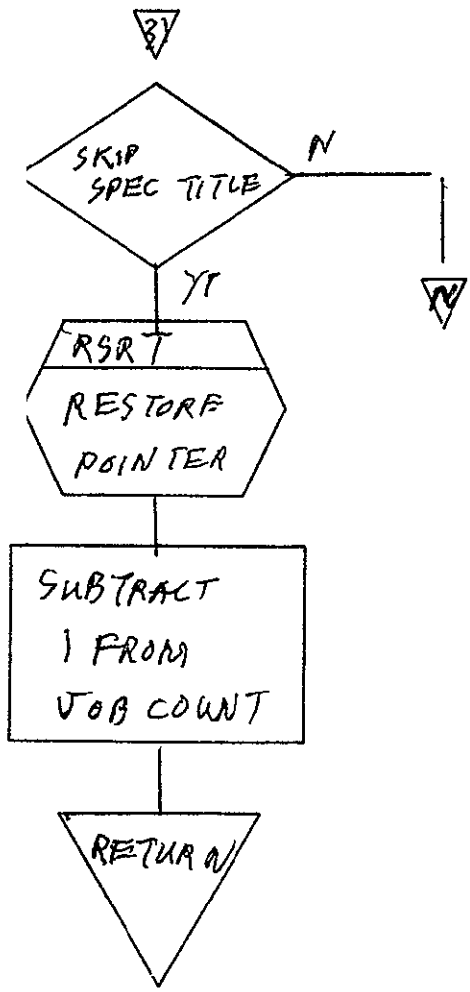

RSPT
RESTORE
MAG TAPE
WORD COUNT
RESTORE
MAG TAPE
POINTER
RESTORE
MAG TAPE
SW
RESTORE
MAG TAPE
BIT COUNT
RETURN

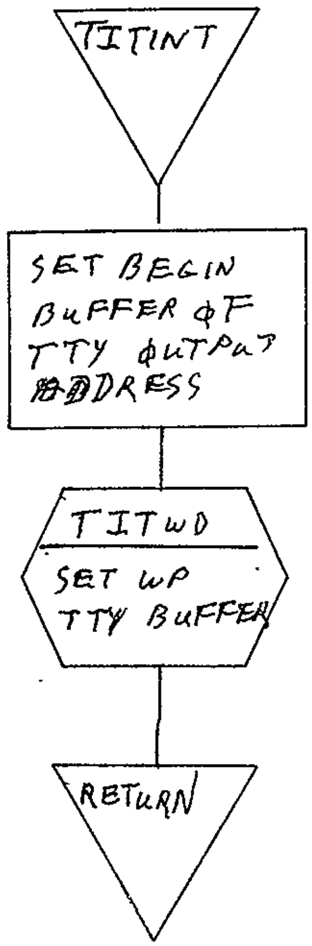

M
1ST TIME CALLED
N
29
Y
GETT8
GET 1ST CHARACTER FROM RECORD
COM RECORD 'D9
N
17
Y
GETT8
GET 2ND CHARACTER FROM RECORD
TITLE RECORD
N
17
Y
39

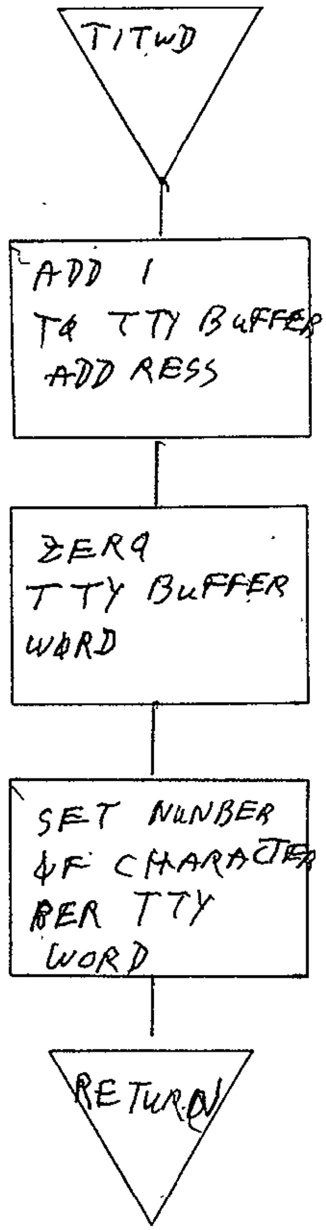

28
ADD 1 TO
JOB COUNT
LIST ONLD
N
Y
LSTON
OUTPUT
TITLE TO
TTY
SET 1ST
TIME SW
TO N
STEP DOWN
TO NEXT
LOC RECORD
29

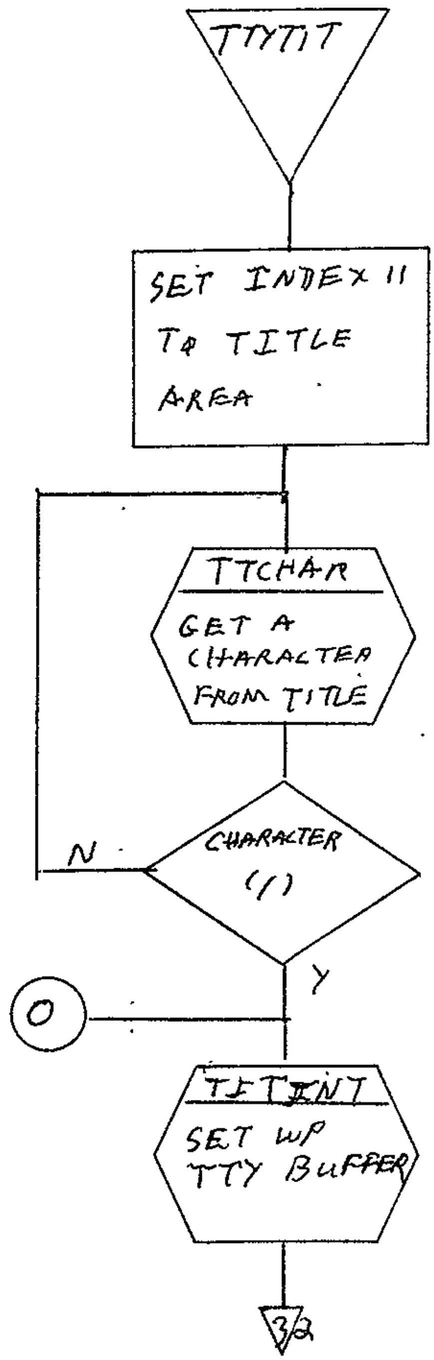

29
RDPT
SAVE
READ POINTER
GETT 8
GET 1ST
RECORD
COMP
CONTROL
D9
Yes
30
NO
N
STEP DOWN
TO NEXT
LOG RECORD
29

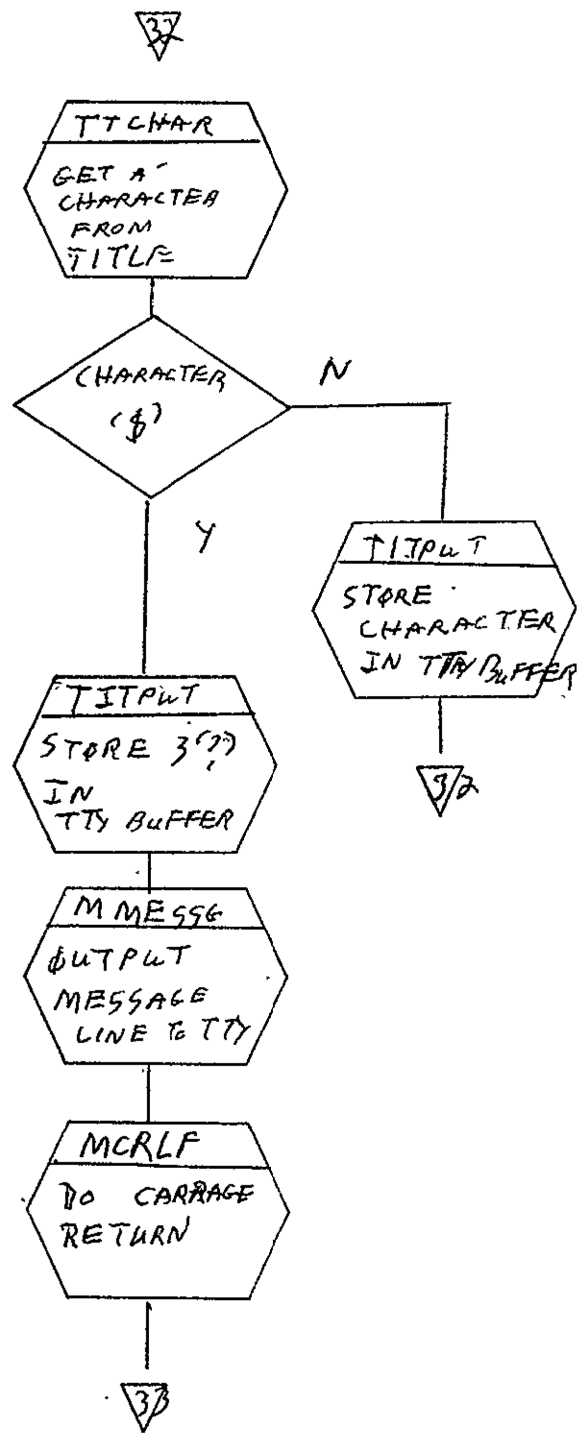

30
GETT8
GET 2ND CHARACTER
TITLE RECORD
N
Y
M
ADD 1 TO JOB COUNT
LISTON
N
Y
31
LSTON
OUTPUT TITLE TO TTY
31

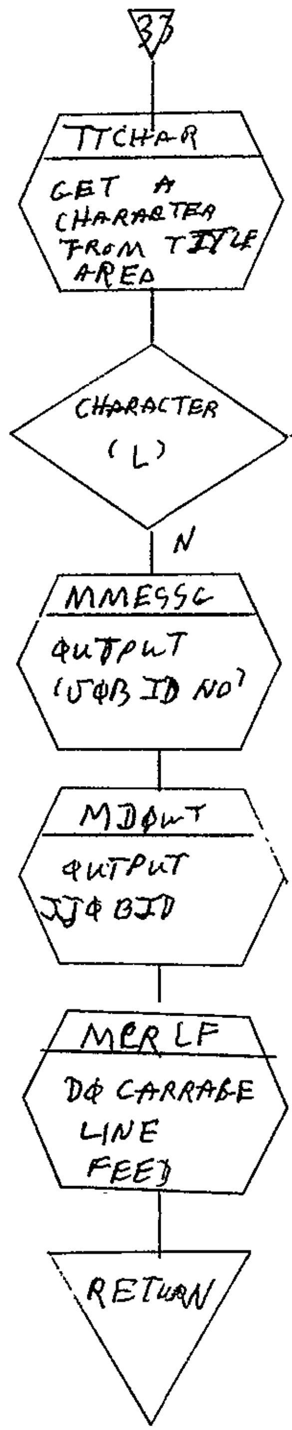

31
SKIP SPEC TITLE
N
N
YT
RSRT
RESTORE POINTER
SUBTRACT 1 FROM JOB COUNT
RETURN

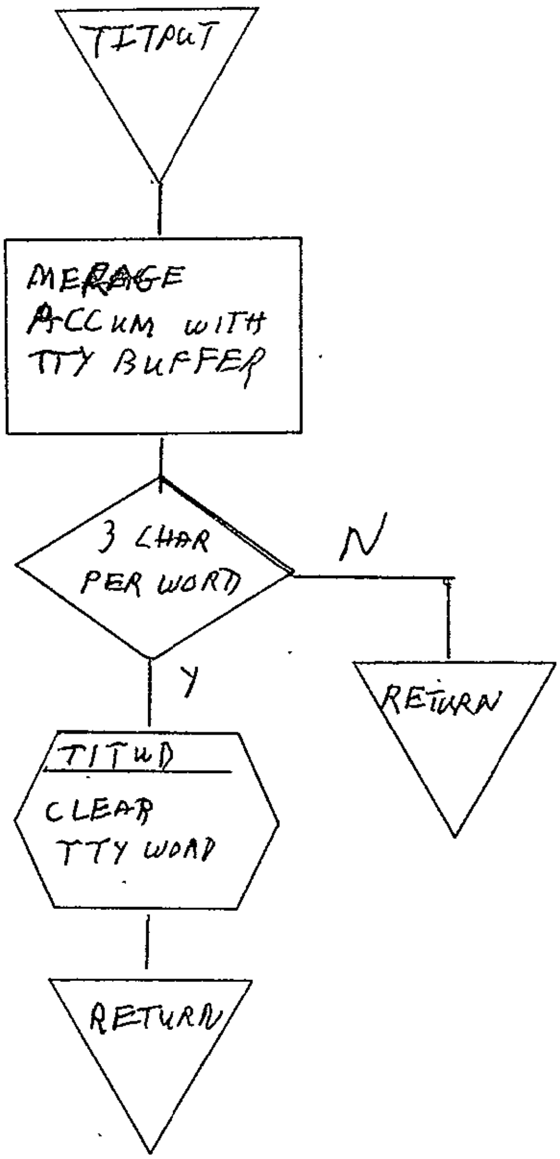

TITINT
SET BEGIN BUFFER ΦF TTY ΦUTPUT ADDRESS
TITWD
SET UP TTY BUFFER
RETURN

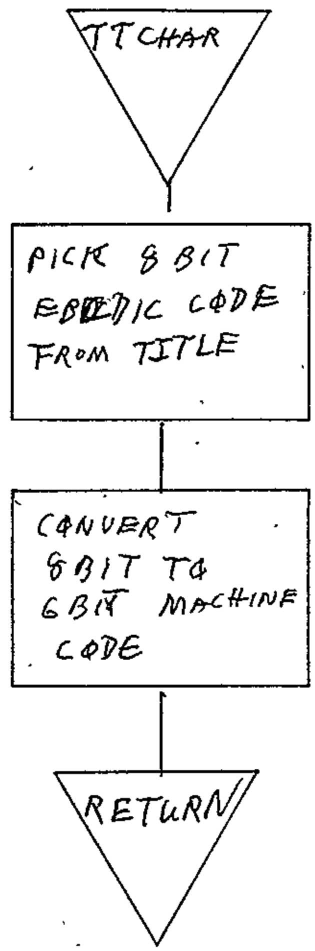

TITWD
ADD 1
TO TTY BUFFER
ADDRESS
ZERO
TTY BUFFER
WORD
SET NUMBER
OF CHARACTER
PER TTY
WORD
RETURN

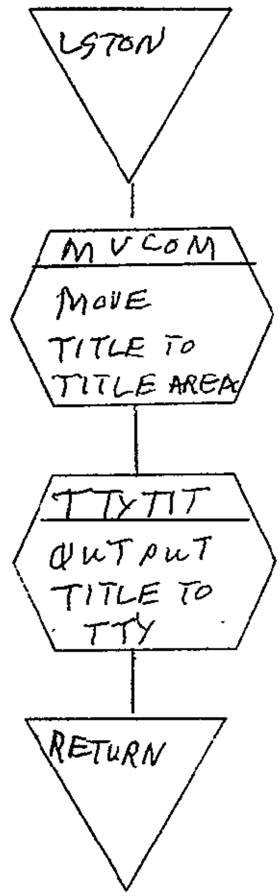

TTYTIT
SET INDEX 11 TO TITLE AREA
TTCHAR
GET A CHARACTER FROM TITLE
CHARACTER (/)
N
Y
O
TTTINT
SET UP TTY BUFFER
3/2

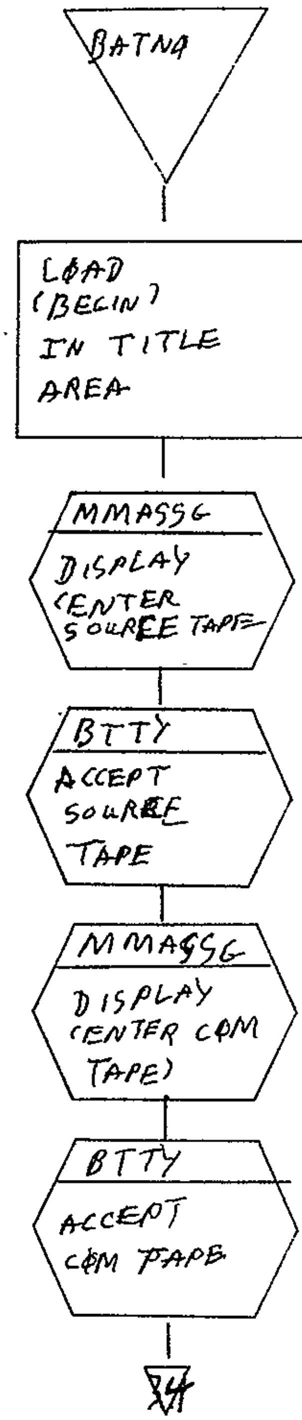

TTCHAR
GET A CHARACTER FROM TITLE
CHARACTER ($)
N
Y
TTIPUT
STORE CHARACTER IN TTY BUFFER
TTIPUT
STORE 3'??
IN TTY BUFFER
MMESSG
OUTPUT MESSAGE LINE TO TTY
MCRLF
DO CARRAGE RETURN

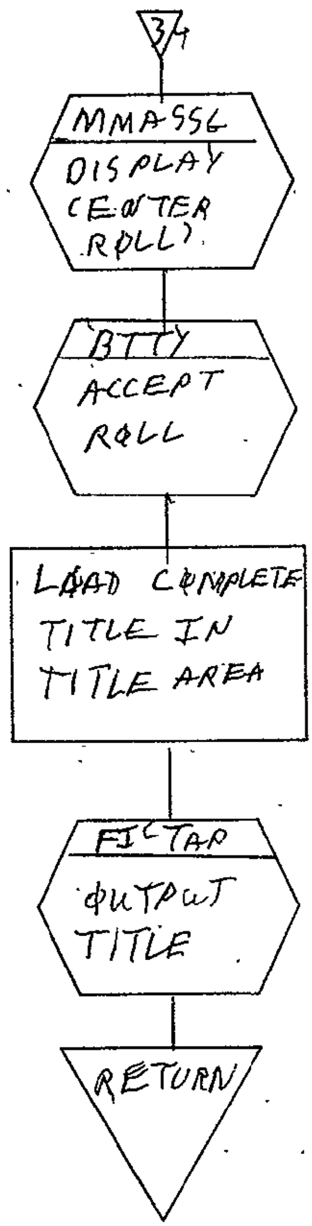

37
TTCHAR
GET A CHARACTER FROM TITLE AREA
CHARACTER (L)
Y
N
0
MMESSG
OUTPUT (JOB ID NO)
MDOUT
OUTPUT JJOBID
MCRLF
DO CARRAGE LINE FEED
RETURN

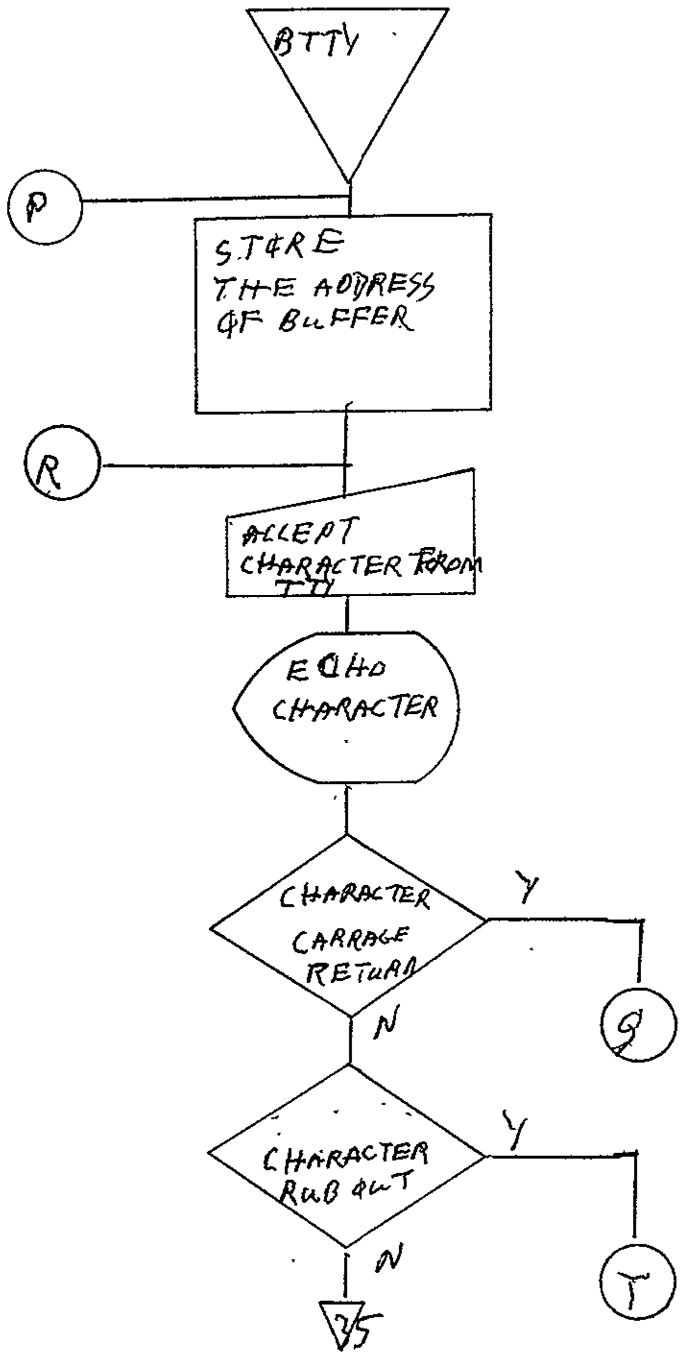

TITPUT
MERAGE
ACCUM WITH
TTY BUFFER
3 CHAR
PER WORD
N
Y
RETURN
TITWD
CLEAR
TTY WORD
RETURN

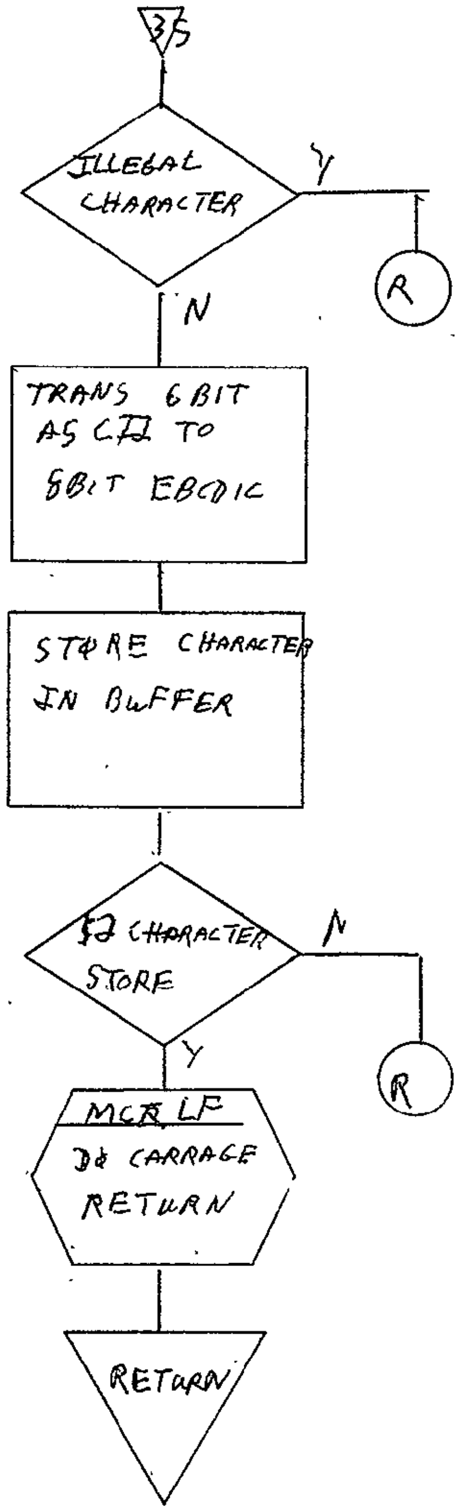

TTCHAR
PICK 8 BIT EBCDIC CODE FROM TITLE
CONVERT 8BIT TO 6BIT MACHINE CODE
RETURN

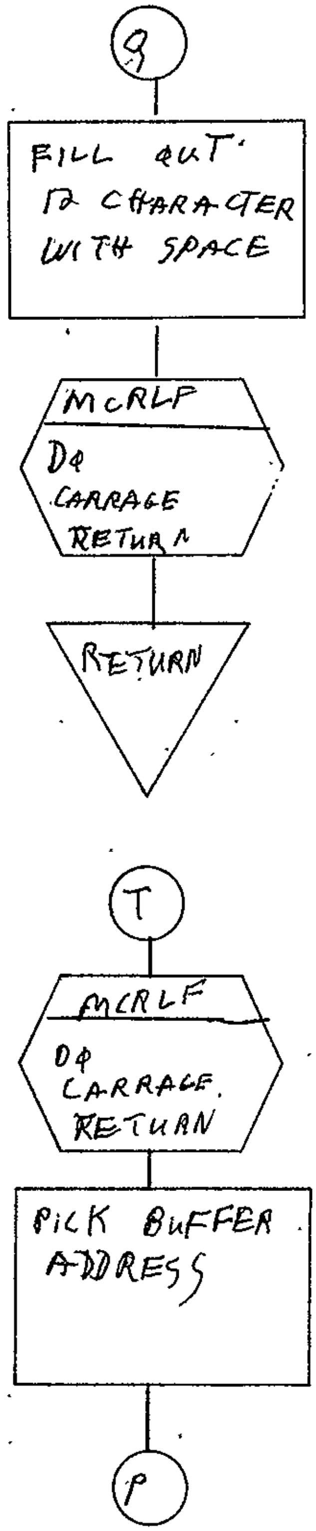

LSTON
MVCOM
MOVE
TITLE TO
TITLE AREA
TTYTIT
OUTPUT
TITLE TO
TTY
RETURN

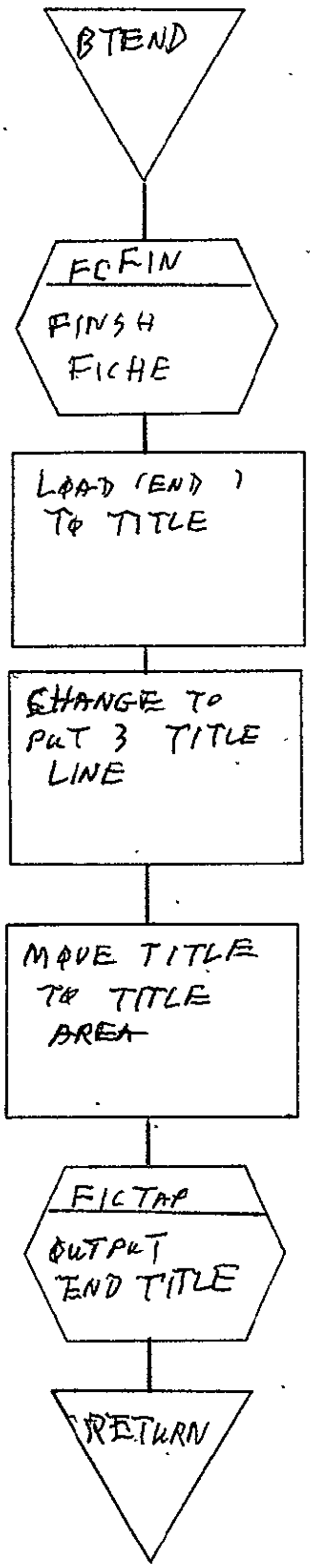

BATNA
LØAD
(BEGIN)
IN TITLE
AREA
MMASSG
DISPLAY
(ENTER
SOURCE TAPE
BTTY
ACCEPT
SOURCE
TAPE
MMASSG
DISPLAY
(ENTER CØM
TAPE)
BTTY
ACCEPT
CØM TAPE
34


34
MMA556
DISPLAY CENTER ROLL)
BTTY
ACCEPT ROLL
LOAD COMPLETE TITLE IN TITLE AREA
FICTAP
OUTPUT TITLE
RETURN


BTTY
P
STORE THE ADDRESS OF BUFFER
R
ACCEPT CHARACTER FROM TTY
ECHO CHARACTER
CHARACTER CARRAGE RETURN
Y
N
Q
CHARACTER RUB OUT
Y
N
T
35


35
ILLEGAL CHARACTER
Y
R
N
TRANS 6BIT ASCII TO 8BIT EBCDIC
STORE CHARACTER IN BUFFER
52 CHARACTER STORE
N
R
Y
MCRLF
DO CARRAGE RETURN
RETURN


9
FILL OUT 12 CHARACTER WITH SPACE
MCRLF
DO CARRAGE RETURN
RETURN
T
MCRLF
DO CARRAGE RETURN
PICK BUFFER ADDRESS
P


BTEND
FCFIN
FINSH
FICHE
LOAD (END)
TO TITLE
CHANGE TO
PUT 3 TITLE
LINE
MOVE TITLE
TO TITLE
AREA
FICTAP
OUTPUT
END TITLE
RETURN

2.11 COMA UNIVAC 494 PRINT PROCESSOR FOR 105 mm FICHE (94U105)

2.11.1 Background

A. Author. I. J. Morgan, Aeronutronic Ford Corp.

B. Intent. Requested when a Univac 494 print 7-track magnetic tape has been submitted for data to be output to microfiche (105 mm film). The requirements for this program are specified in SH-09846.

C. Program History

1. Production Tape Date. 19 June 1973

2. Author. I. J. Morgan

3. Authorization. EO-204F

4. Test Cases. TPS (JSC Form 1225) No. A17

5. Revisions. Reference Appendix B, paragraph B.11

2.11.2 Introduction. This paragraph describes the usage and design of the Univac 494 Print Processor for 105 mm microfiche (94U105). The MONITOR and associated I/O driven routines are described in SISO-TR531, Vol. I.

2.11.2.1 Hardware Requirements

- FR80 with 12K memory
- 7-track tape unit
- 105 mm camera.

2.11.2.2 Software Requirements. The following files from I.I.I.'s SYM Directory are required.

III109	III185	III162	III187
III166	III163	III161	FLOAD
III164	III147	III161 GO	III186

2.11.2.3 Assembly Parameters. The assembly parameters in III109 should be set for the proper machine configuration. Assembly parameters specific to the 94U105 Print Processor are as follows.

A. 7-TRACK. If 1, indicates data will be coming from a 7-track tape drive.

B. MUMBLE. If 1, indicates system configuration for output to teletype.

C. CAMNUM. If 9, indicates 105 mm camera is being used.

D. PTYPE. If 3, ensures compatibility with EBC forms.

E. ALLOW. Defines code to allow form loading and flashing.

F. NUMCAM. If 6, facilitates camera change at run time.

G. TWOBUF. If 1, gives two magnetic tape buffers for higher throughput.

H. BIGBUF. If 1, allows maximum amount of features with minimum buffer space.

I. MTPTR. If 10, assigns the active buffer address to auto-index register 10.

J. MTSIZE. Magnetic tape buffer size.

K. MTTSIZ. Teletype buffer size.

L. FTYPE. 105 mm camera indicator.

M. FONT. Must be defined to direct the inclusion of a font at the end of III164; 0 = film.

N. MTWRDS. If 1, GETT (Get Bits Subroutine) will not be assembled.

O. FINDEX. Allows form indexing.

P. MANYUP. If nonzero, indicates page and frame number will be printed.

Q. NODISP. If defined, MONITOR command list will not be displayed.

R. UNIVAC. If 1, defines the Univac Fieldata character set.

2.11.2.4 Operator Commands. The following commands are available for use, but, since the command list is not displayed, none can be modified.

```
*
*TIME=0'0"
*FRAME=0
*CURRENT PAGE=0
*GO
*CONTINUE
*MAKE FILM=1
*CLEAR
*ADVANCE
*TAPE TYPE - 2,5 OR 8=8
*BACK
*PARITY=1
*USE=1
*REWIND
*SKIP
*TRY AGAIN=10
*FORM = NULL   16FRM1   16FRM2   16FRM3   16FRM4
*ERROR FORM=NO
```

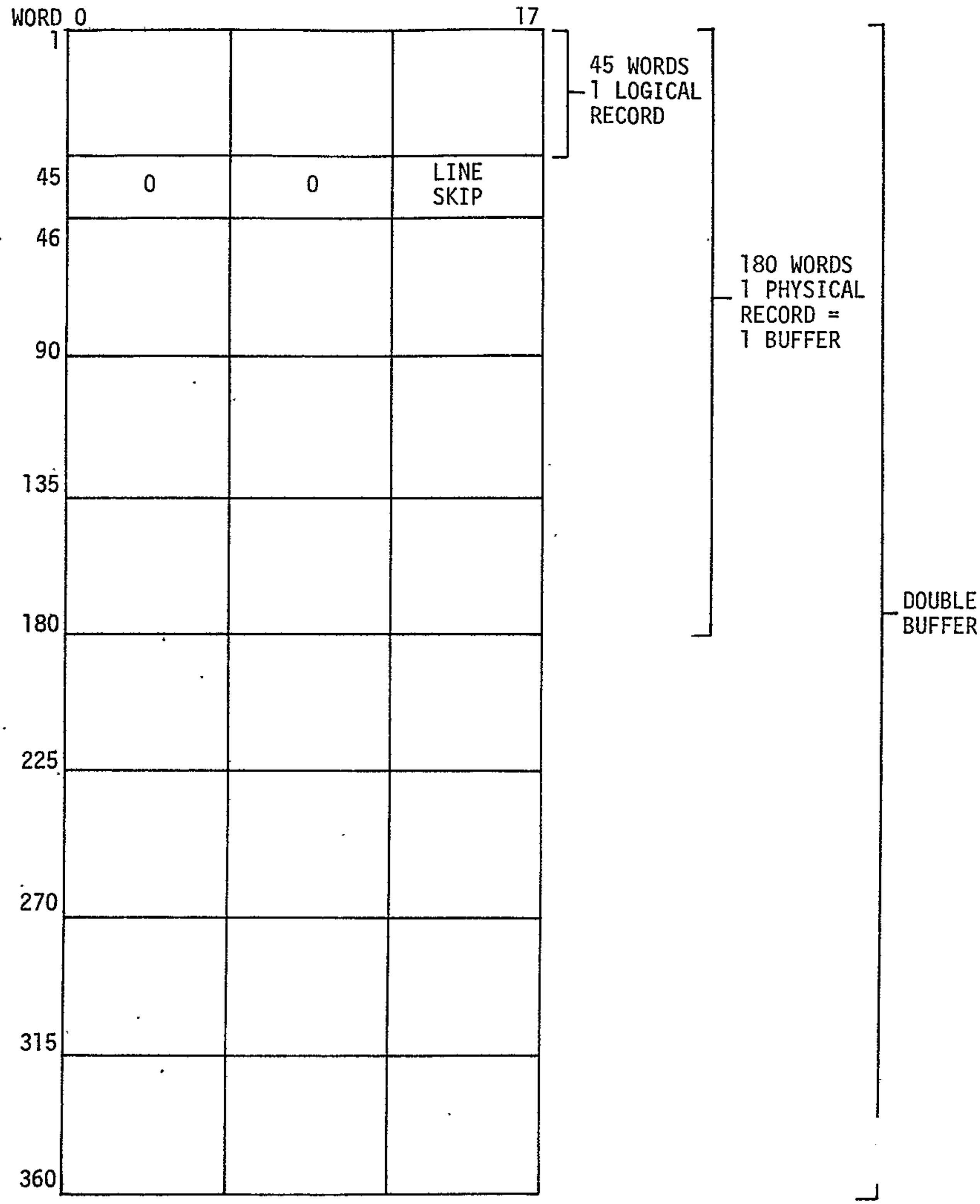
2.11.3 Analysis

2.11.3.1 Major Control Section

A. Description. This program is requested to be run by the operator when a 494 print tape is to be output to microfiche. The program is called by MONITOR (III166) through the PSTART Subroutine. Data is read into core from the tape by the double buffer process using MTRINI, a subroutine in III163. A buffer area of 360 words is reserved for this read. There are four logical records of 45 words each in each physical record of 180 words (see figure 2-1). The camera is advanced to the next fiche to assure that no overwriting occurs. Parameters are set to output 207 print pages per microfiche.

The first and second words of the first logical record are examined. If this is a job separator control record, the program goes to the JOBREC Routine. If not, the error message CONTROL ERROR is output and control is given back to MONITOR. JOBREC is executed when a job separator record is found. The job information to be output to the fiche is stored in TTYBUF. The previous job (if this is not the first one) is finished by the subroutine FICTAP. NEXPIC is called to advance to the next page and frame. HEADER and TOPPAG ready the fiche for the new job by setting the new X and Y coordinates, character size, and light intensity. The next logical record is then picked up. If this is another control record, it will go to the appropriate control routine as described below. Otherwise, the record is output as print data by the routine DATREC.

TREC processes the title control record. The information for the title is stored in the TTYBUF by the subroutine MVCOM. FICTAP is then called to decode and output both the job and title control record information. If there is no title control record, the job name will be output when the first data record is encountered. TOPPAG is called after the job and title information has been output to ready the fiche for the first data.



LINE SKIP NO. = 0 THRU 63

Figure 2-1 94U105 Buffer Area

FRMREC is called when a form control record has been encountered. The form number is found in the first byte of the third word of this record by the subroutine BYT3WD. It is stored in the location FRMNUM. If a form greater than four was requested, the message ILLEGAL FORM is output to the teletype, and the program returns to process the next record after storing a zero in FRMNUM. If the form number is zero, FLASSW is set so that a form will not be flashed. The subroutine BYT3WD is again called to get the second byte of the third word of the record. If this byte does not contain an I, the program processes the next logical record. An I indicates that indexing is being requested. The subroutine NMGET is called to pick up and convert from Fieldata to binary the line number to be indexed (stored in location YINDX); the beginning byte in the print line (stored in location XINDX), and the number of characters to be output for this line in the index frame (stored in location CHRCNT). The switches INXSSW and IFLASW are set for the index frame to be flashed at the end of the fiche.

When an image orientation record is encountered, ROTCOM causes the COMIC mode to be used.

DATREC is called when print data is found. A total of 132 characters are output. If this is the line that is to be used for indexing, INXOUT is called to save the necessary data for the index frame. The line skip number is found in the last word of the logical record. The number of carriage returns executed is equal to this number plus one, with the line count number, LNCNT, being incremented each time. When LNCNT equals 64, PPAGE flashes the form, if any, and NEXPIC is called to advance the page. NEXPIC will also output the index frame and advance to the next fiche if this is the last page of data for that fiche. TOPPAG then sets the X and Y coordinates for the new page.

After processing each data record, the program returns to pick up the next logical record. The program continues until an end-of-job, end-of-tape control record is encountered. The end-of-job, end-of-tape control record is encountered when all the jobs on a single or multiple tapes have been processed. PPAGE is called to flash the form on the last page, if one is present, and then the program goes to MTEOFF which goes to MONITOR and types out END OF FILE. END JOB/) is input by the operator to complete the last fiche.

B. Inputs/Output

1. Input. Data is input from a 7-track tape drive in logical units of 45 words each and in physical records of 180 words each.

2. Output. Output of data is to a 105 mm fiche (microfiche). Each microfiche has the capacity for 207 print pages with each page having a maximum of 64 lines per page, 132 characters per line.

3. Error Message Output

   a. CONTROL ERROR. This is output when the first logical record of a job is not a control record.

   b. ILLEGAL FORM. This is output when a form number greater than four has been requested.

   c. NO FORM. This is output when the form number is equal to zero and FLASSW has not been properly set to prevent the logic from reaching this point.

C. Linkages

1. External

Routine	Program	Calling Sequence
MTLAC	III163	JMS MTLAC
MTRINI	III163	JMS MTRINI
FC7CLR	III166	FC7CLR
FRSPIC	III166	FRSPIC
INXDO	III166	JMS INXDO
KYBLIS	III166	JMS KYBLIS
MCRLF	III166	JMS MCRLF
MMESSG	III166	JMS MMESSG
MONINT	III166	JMS MONINT
MONOUX	III166	JMS MONOUX
MTEOFF	III166	JMS MTEOFF
NEXPIC	III166	NEXPIC
ROTATR	III166	JMS ROTATR
SETOMU	III166	JMS SETOMU

Routine	Program	Calling Sequence
SETPLS	III166	SETPLS
SETXYS	III166	JMS SETXYS LAC X-COORDINATE LAC Y-COORDINATE
FICTAP	III186	JMS FICTAP
FLASH	PRO187	FLASH

2. Internal

Routine	Calling Sequence
BYT3WD	JMS BYT3WD
EBGET	JMS EBGET
HEADER	JMS HEADER
INXOUT	JMS INXOUT
MVCOM	JMS MVCOM
NMGET	JMS NMGET
NMGET1	JMS NMGET1
NXWD	JMS NXWD
PFLASH	JMS PFLASH
PPAGE	JMS PPAGE
RDPT	JMS RDPT
RSPT	JMS RSPT
SETBYT	JMS SETBYT
STARTX	JMS STARTX
TOPPAG	JMS TOPPAG

2.11.3.2 Subroutines

A. BYT3WD. Used to access one particular byte in a word. Prior to BYT3WD being called the first time, SETBYT has been called to set flags to indicate that none of the three bytes have yet been processed. When none of the flags are set, the next word in the buffer is obtained. The word is divided into bytes with bits 0-5 being stored in word location UBYTE, bits 6-11 in word location UBYT1, and bits 12-17 in UBYT2. UBYTE is then passed to the calling routine. The next time BYT3WD is called, UBYT1 will be passed, and on the third call, UBYT2 will be passed unless SETBYT has been requested to reset these flags.

B. EBGET. Called by NMGET and NMGET1, which store the number of bytes to be converted in the location TEMP. EBGET calls BYT3WD to obtain each byte. The byte is converted from Fieldata to binary and added to the last digit converted, if this is not the first. EBGET continues to process bytes until all the bytes have been converted.

C. HEADER. Called at the beginning of a job to set the X delta, the Y delta, the character size, the intensity, and the spot size.

D. INXOUT. Called when a line is to be saved for the index frame. SETBYT is called to reset the byte flags. STARTX is then called to clear TTYBUF and to store the complemented character count in MCHCNT and IXXLEN. Each byte is moved into TTYBUF. When all information has been moved, INXDO is called to save the information for the index frame. IXXLEN is used by the subroutine INXDO.

E. MVCOM. Moves data for the job separator record and the title record into TTYBUF. It is entered with the first character in the MQ and processes bytes until an end-of-data ($T) is encountered.

F. NMGET. Sets count for EBGET to process three Fieldata characters.

G. NMGET1. Sets count for EBGET to process two Fieldata characters.

H. PFLASH. Called by PPAGE to flash a form. When entered, it is determined if the FRMTAB, which contains the addresses to the forms, contains all zeros. If so, the pro gram jumps to an error exit (NO FORM). If not, the addre is obtained and FLASH is called to flash the form.

I. PPAGE. Called to determine if a form is to be flashed. If any characters were printed on the page, the program goes to PFLASH. If not, the program exits.

J. RDPT. Saves the count, MTCNT, and the address pointer, MTPTR, in the buffer.

K. RSPT. Restores MTCNT and MTPTR to point to the next word to be processed.

L. SETBYT. Resets the flags for bytes to be processed by BYT3WD.

M. STARTX. Called by INXOUT to clear the teletype buffer; also complements and stores CHRCNT, the character count, in the locations MCHCNT and IXXLEN.

N. TOPPAG. Resets the X and Y coordinates for the top of the new page and for the next form. It calls SETXYS to actually set the X and Y DAC's.

2.11.3.3 Constants and Variables

A. Internal

1. BUFFER. Area reserved for two physical records of 180 words each.

2. CURBUF. Word containing the address of the buffer currently being used.

3. CHRCNT. Word containing the number of characters to be output for indexing.

4. DBLADR. Address of message, DOUBLE END OF FILE.

5. ERFLAG. Flag that, when set to zero, indicates that the error form flag is to be checked.

6. ERFMFL. Error form flag.

7. FLASSW. Location in the program used to determine if a form is to be flashed.

8. FOLFTX. Location containing the beginning raster point (X coordinate) for a form.

9. FRMINP. Contains address of first form.

10. FRMNUM. Contains the number of the form to be flashed.

11. FRMPTR. Address of form to be flashed.

12. FRMTAB. Six-word table with each word giving the beginning address of a form.

13. LEFTXX. Location containing the beginning X coordinate for a line print.

14. LENGTH. Word giving half the total buffer size (a negative number).

15. LNCNT. Word containing the number of lines that are left to be output for this page (negative number).

16. MCHCNT. Location containing the number of bytes to process for indexing.

17. LNFDNM. Number of scope points to advance to the next line (negative).

18. NEWTOP. Location containing the Y coordinate of the line to be output.

19. NEXBUF. Word containing the address of the next buffer to be used.

20. RDCNT. Location used to save MTCNT.

21. RDPTR. Location used to save MTPTR.

22. SAVIRM. Temporary location.

23. SPCNUM. Location containing the raster size for the X coordinate.

24. TEMP. Temporary reserve location.

25. TOPYY. Location containing the beginning raster point (Y coordinate) for all pages.

26. UBYTE. Location used to store bits 0-5 of a particular word.

27. UBYT1. Location used to store bits 6-11 of a particular word.

28. UBYT2. Location used to store bits 12-17 of a particular word.

29. VCHAR. Location used to store digits temporarily until all numbers have been processed.

30. XINDX. Word containing the character on which the indexing is to start.

31. YINDX. Location containing the line number that is to be used for indexing.

B. External

1. PBUFSZ. Length of a single buffer.

2. MTCNT. Location containing the number of words yet to be processed (negative number).

3. MTPTR. Location containing the address of the word in the buffer to be processed next.

4. CHDELX. Word used to set the delta X.

5. CHDELY. Word used to set the delta Y.

6. CHRSIZ. Word containing the character size.

7. RECPIN. Word containing the intensity.

8. RECSPT. Word containing the spot size.

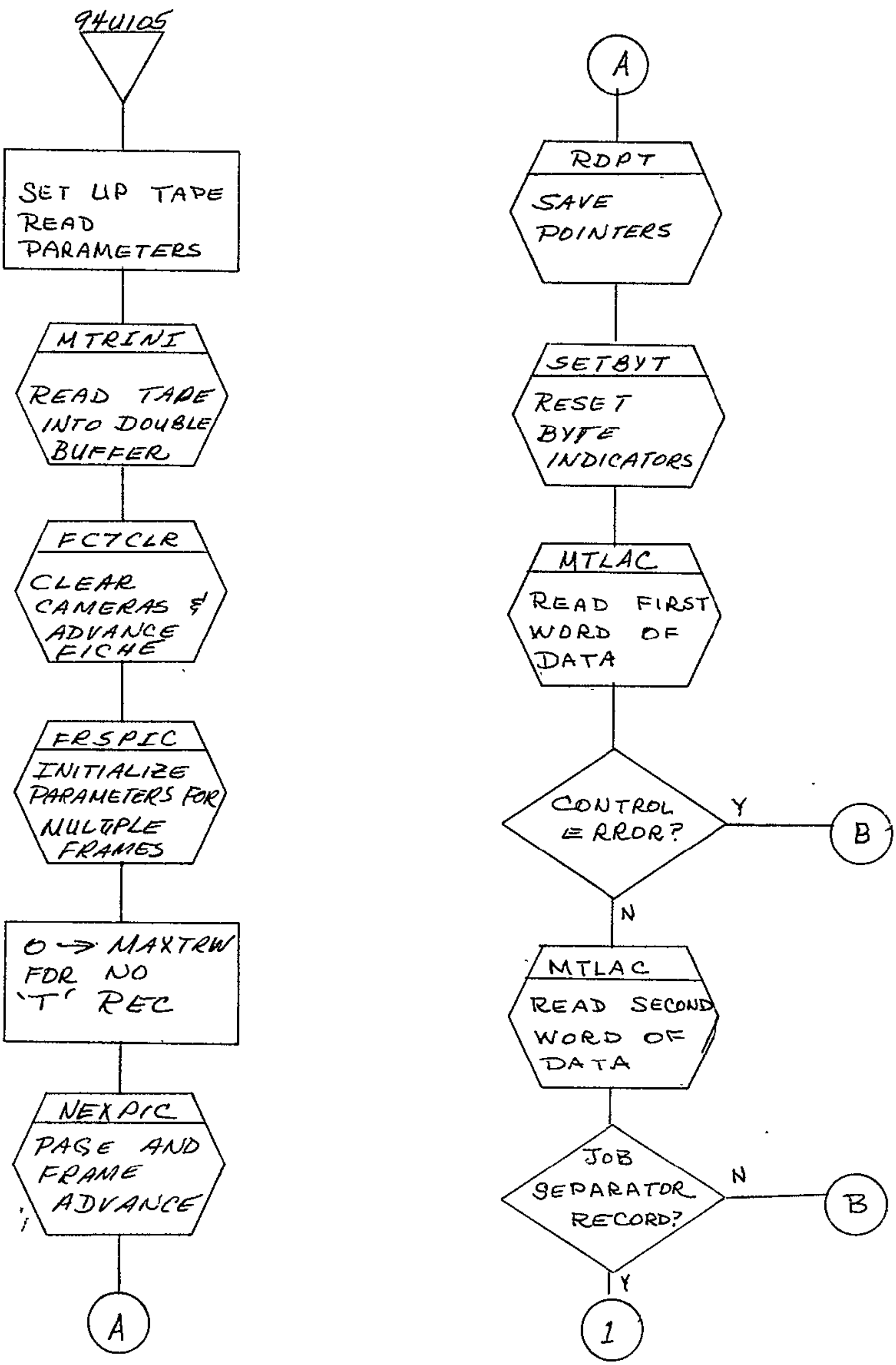
9. TPOINT. Location containing the address of FICTB.

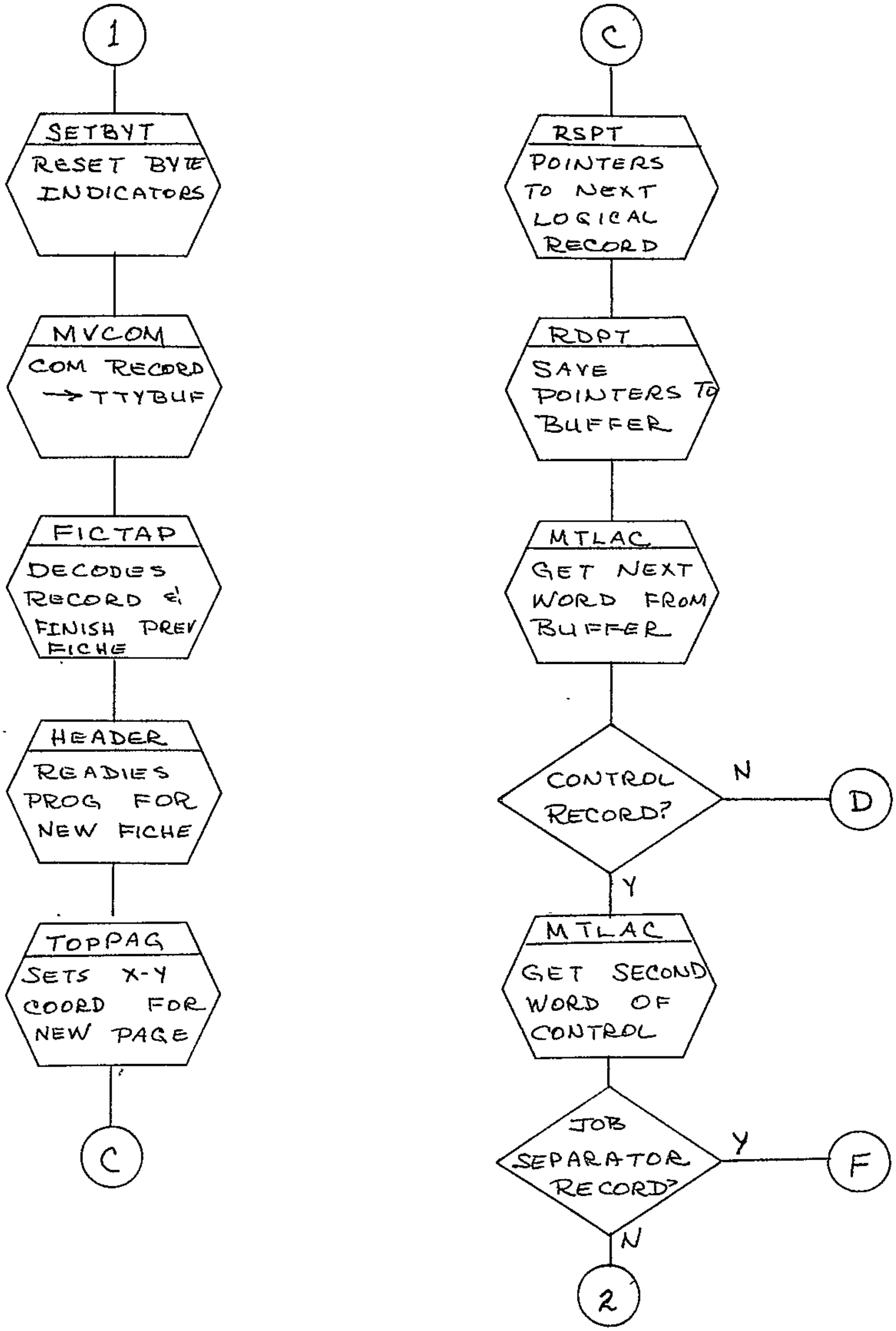
10. MAXTRW. Flag that when set to zero indicates the Title Record has not been processed.

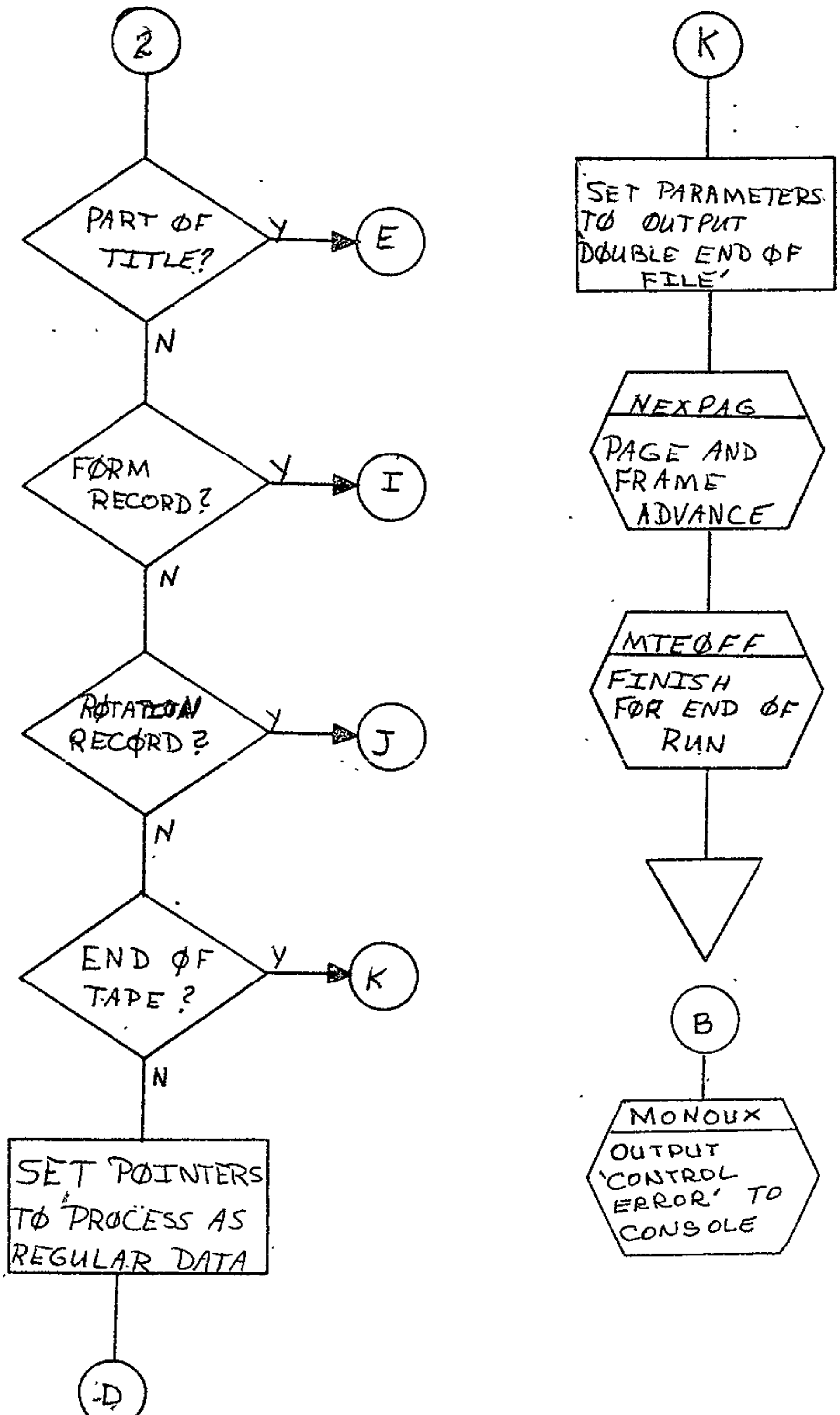
11. INXSSW. Flag used to determine if indexing has been required.

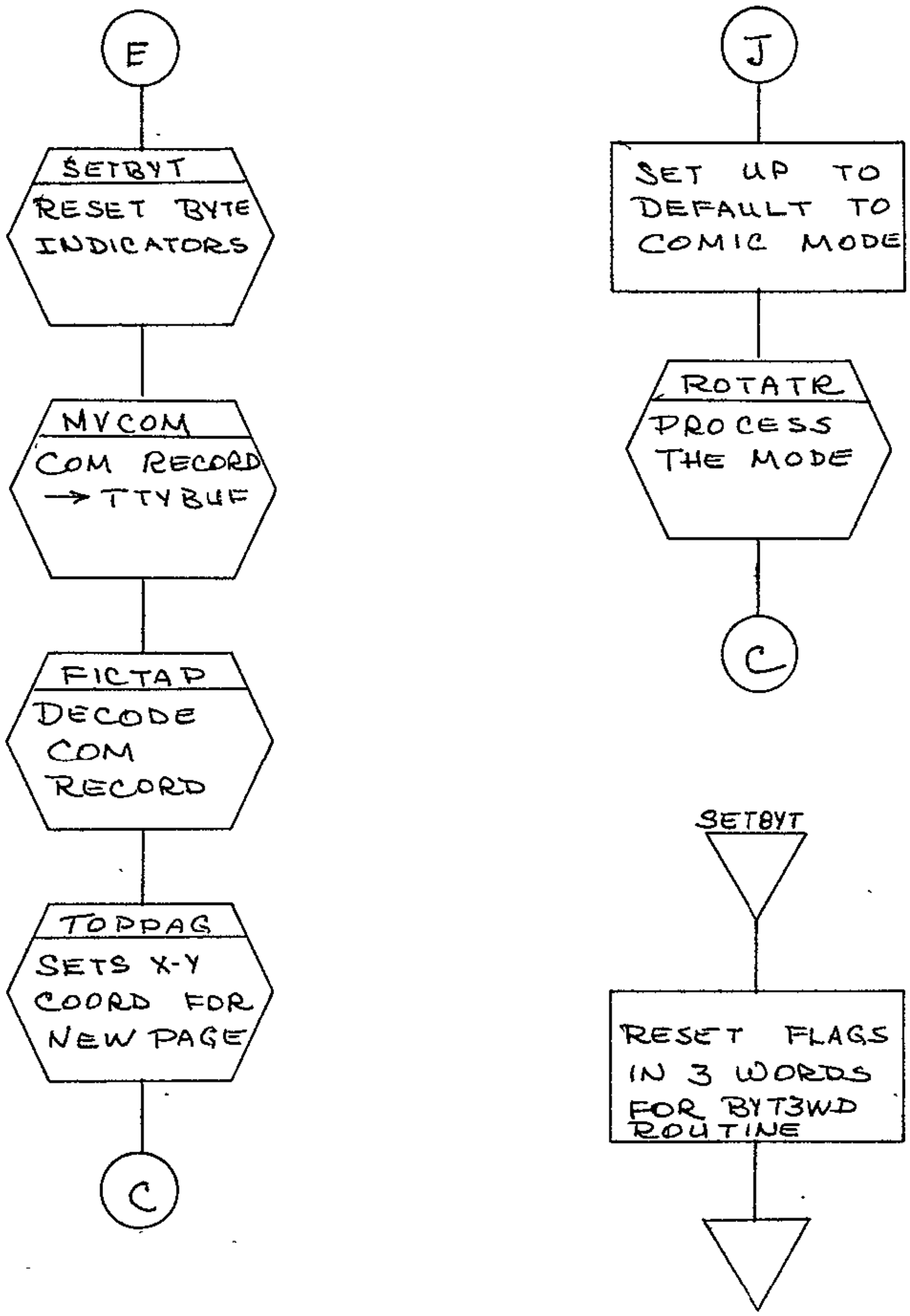
12. IFLASW. Flag used to determine if the index form is to be flashed.

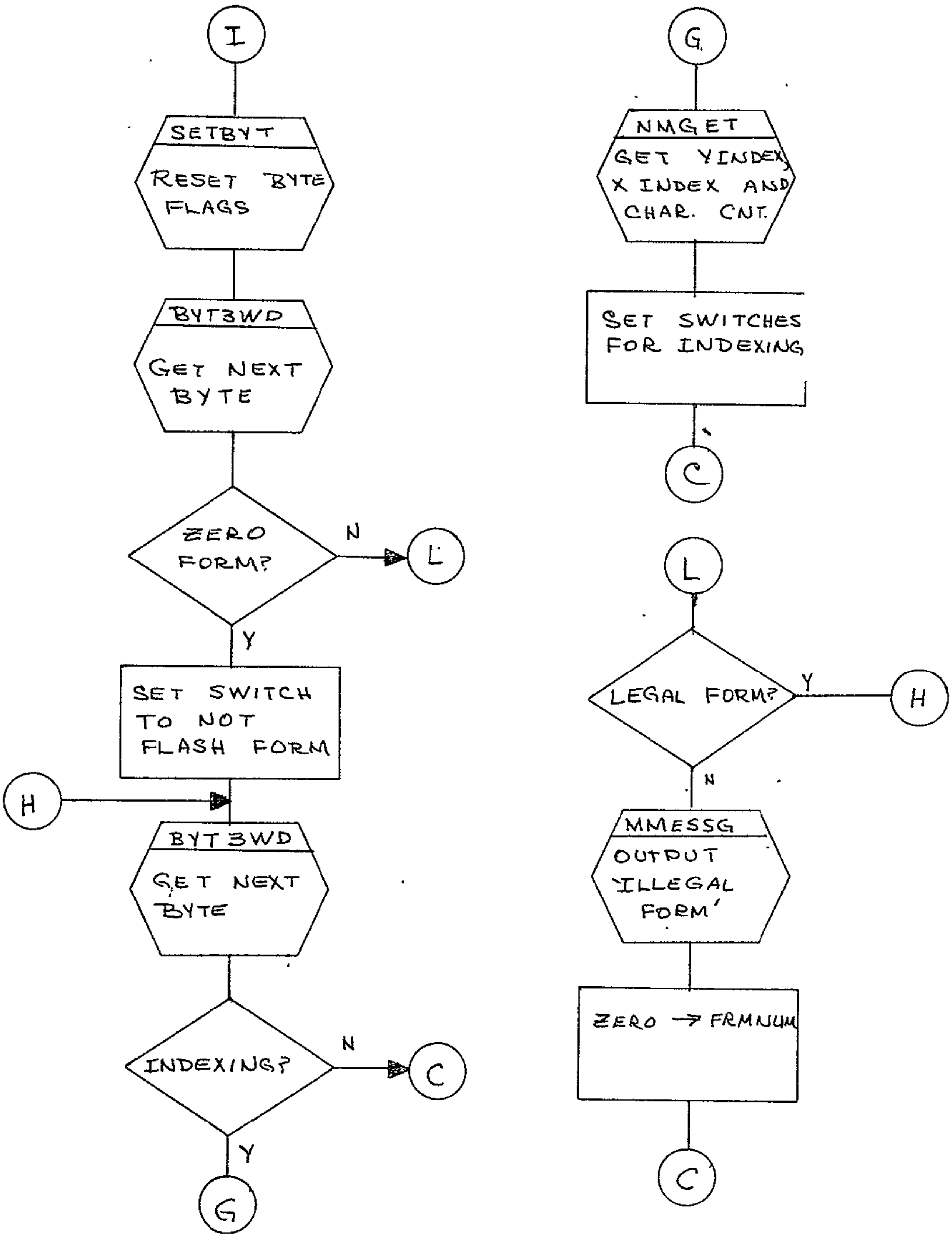
2.11.3.4 Flow Charts. See following pages.

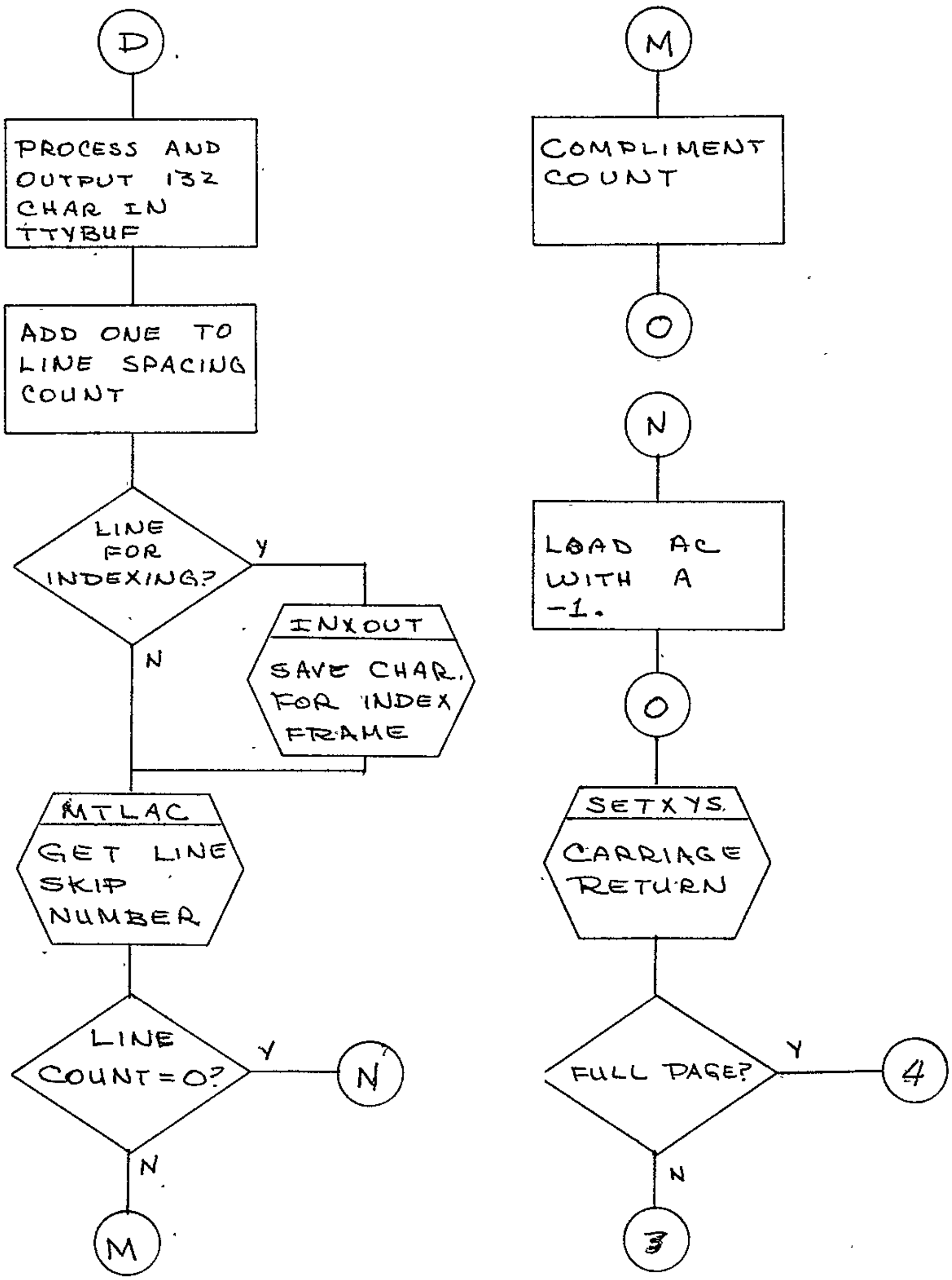

94U105
SET UP TAPE READ PARAMETERS
MTRINI
READ TAPE INTO DOUBLE BUFFER
FC7CLR
CLEAR CAMERAS & ADVANCE FICHE
FRSPIC
INITIALIZE PARAMETERS FOR MULTIPLE FRAMES
0 → MAXTRW FOR NO 'T' REC
NEXPIC
PAGE AND FRAME ADVANCE
A
A
RDPT
SAVE POINTERS
SETBYT
RESET BYTE INDICATORS
MTLAC
READ FIRST WORD OF DATA
CONTROL ERROR?
Y
B
N
MTLAC
READ SECOND WORD OF DATA
JOB SEPARATOR RECORD?
N
B
Y
1

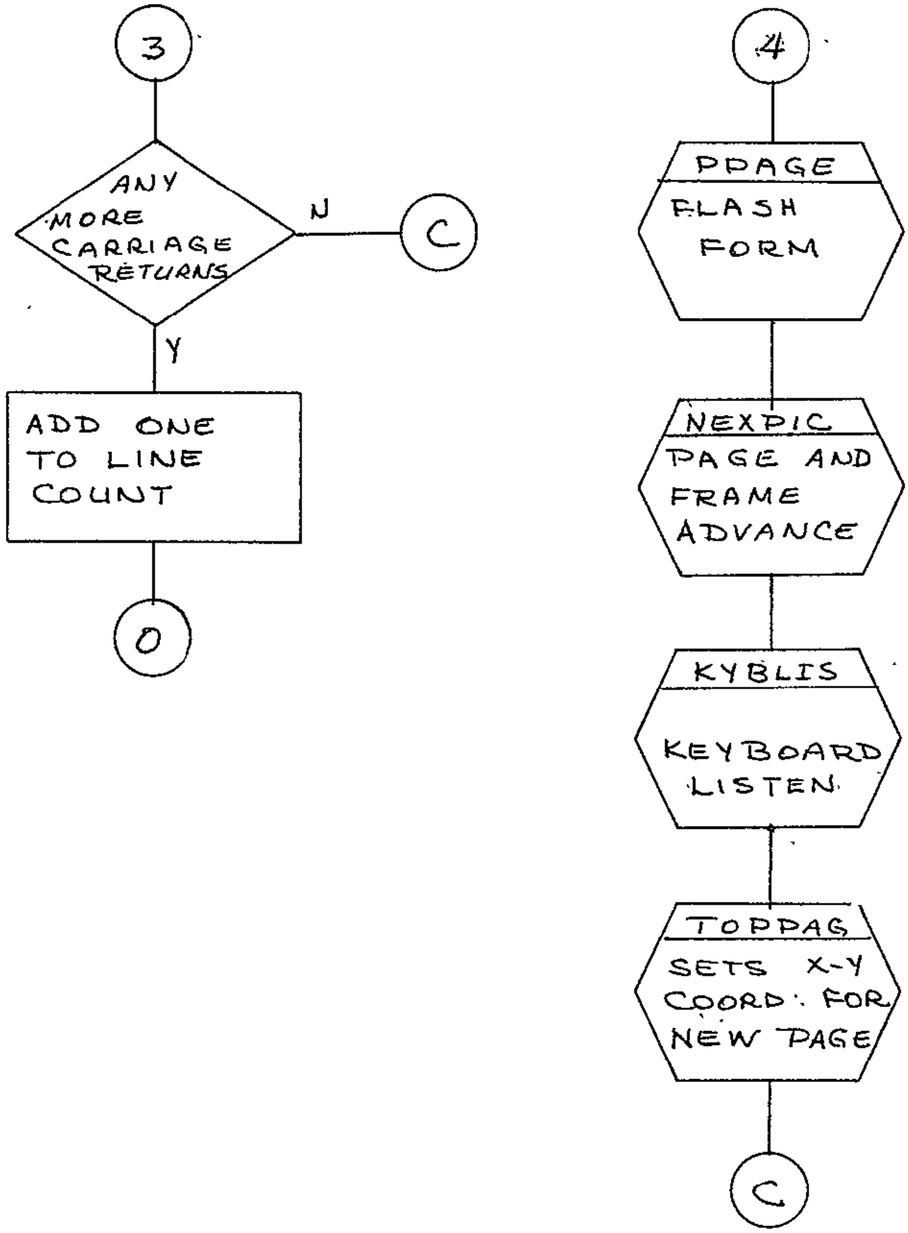

1
SETBYT
RESET BYTE INDICATORS
MVCOM
COM RECORD → TTYBUF
FICTAP
DECODES RECORD & FINISH PREV FICHE
HEADER
READIES PROG FOR NEW FICHE
TOPPAG
SETS X-Y COORD FOR NEW PAGE
C
C
RSPT
POINTERS TO NEXT LOGICAL RECORD
RDPT
SAVE POINTERS TO BUFFER
MTLAC
GET NEXT WORD FROM BUFFER
CONTROL RECORD?
N
D
Y
MTLAC
GET SECOND WORD OF CONTROL
JOB SEPARATOR RECORD?
Y
F
N
2

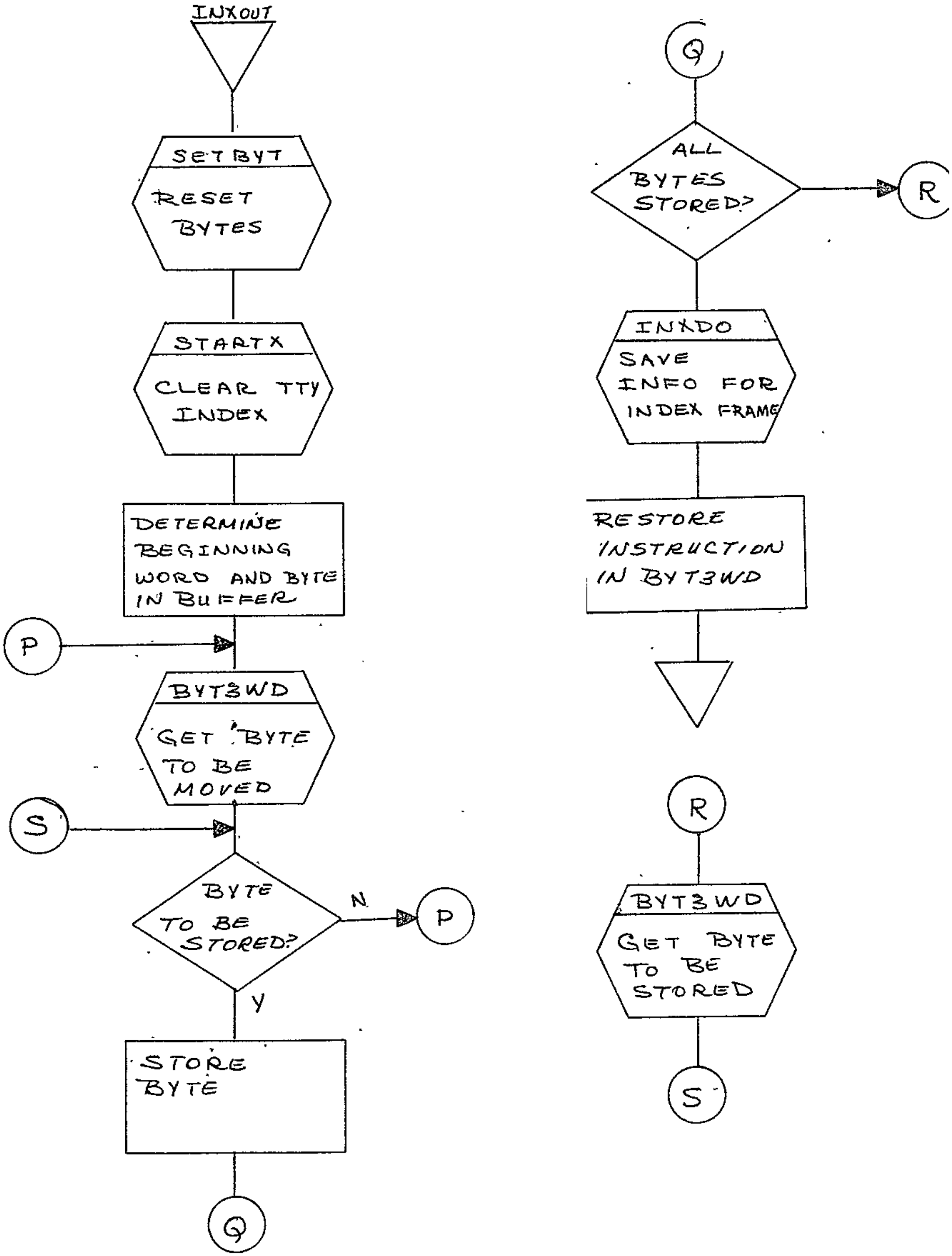

2
PART ØF TITLE?
Y
E
N
FØRM RECORD?
Y
I
N
RØTATION RECØRD?
Y
J
N
END ØF TAPE?
Y
K
N
SET PØINTERS TØ PRØCESS AS REGULAR DATA
D
K
SET PARAMETERS TØ OUTPUT DØUBLE END ØF FILE'
NEXPAG
PAGE AND FRAME ADVANCE
MTEØFF
FINISH FØR END ØF RUN
B
MONOUX
OUTPUT 'CONTROL ERROR' TO CONSOLE

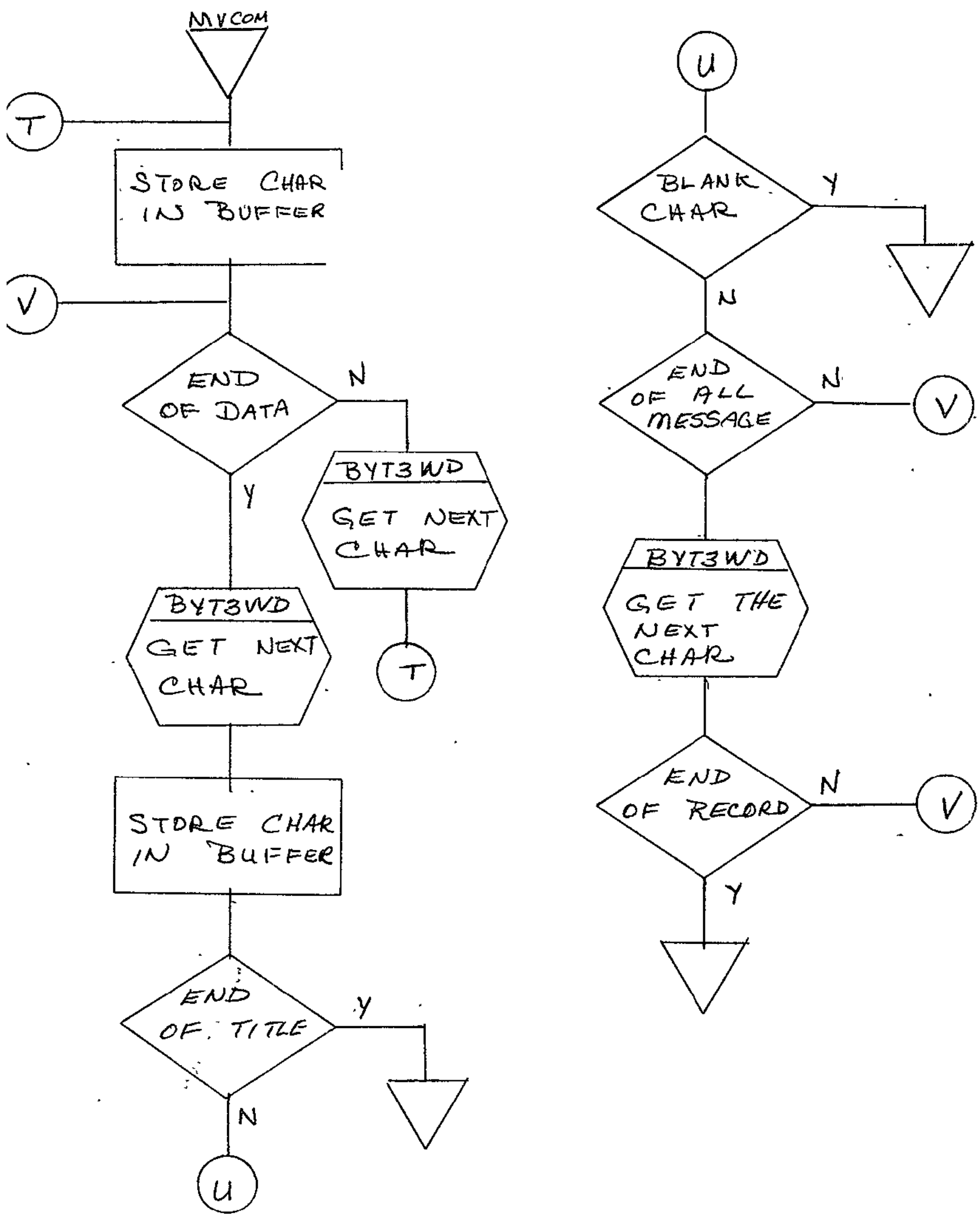

E
SETBYT
RESET BYTE INDICATORS
MVCOM
COM RECORD → TTYBUF
FICTAP
DECODE COM RECORD
TOPPAG
SETS X-Y COORD FOR NEW PAGE
C
J
SET UP TO DEFAULT TO COMIC MODE
ROTATR
PROCESS THE MODE
C
SETBYT
RESET FLAGS IN 3 WORDS FOR BYT3WD ROUTINE

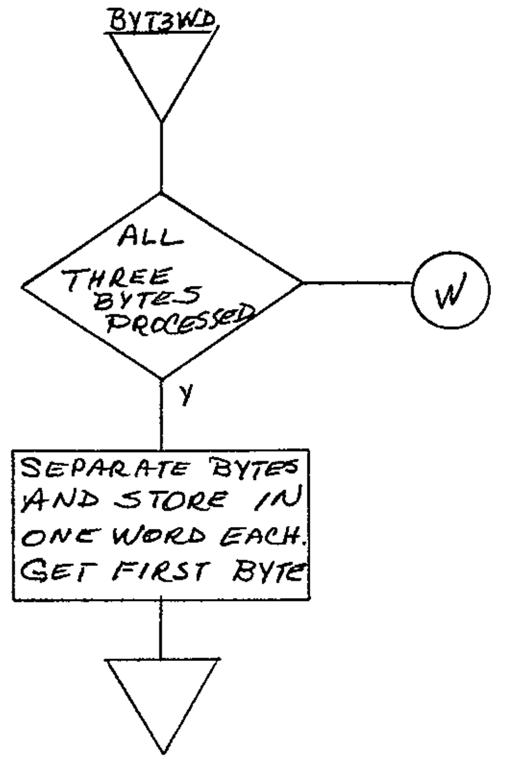

I
SETBYT
RESET BYTE FLAGS
BYT3WD
GET NEXT BYTE
ZERO FORM?
N
L
Y
SET SWITCH TO NOT FLASH FORM
H
BYT3WD
GET NEXT BYTE
INDEXING?
N
C
Y
G
G
NMGET
GET Y INDEX X INDEX AND CHAR. CNT.
SET SWITCHES FOR INDEXING
C
L
LEGAL FORM?
Y
H
N
MMESSG
OUTPUT 'ILLEGAL FORM'
ZERO → FRMNUM
C

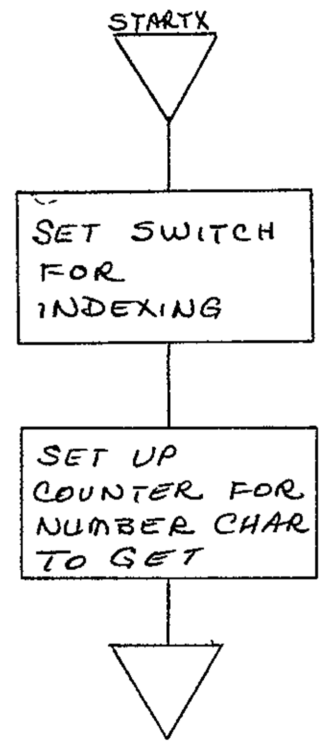

D
PROCESS AND OUTPUT 132 CHAR IN TTYBUF
ADD ONE TO LINE SPACING COUNT
LINE FOR INDEXING?
Y
N
INXOUT
SAVE CHAR. FOR INDEX FRAME
MTLAC
GET LINE SKIP NUMBER
LINE COUNT=0?
Y
N
N
M
M
COMPLIMENT COUNT
O
N
LOAD AC WITH A -1.
O
SETXYS
CARRIAGE RETURN
FULL PAGE?
Y
4
N
3

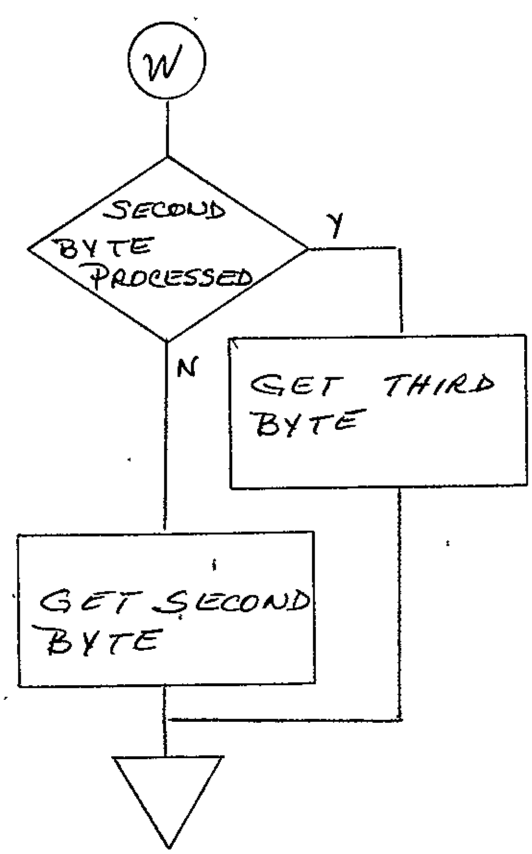

3
ANY MORE CARRIAGE RETURNS
N
C
Y
ADD ONE TO LINE COUNT
0
4
PPAGE
FLASH FORM
NEXPIC
PAGE AND FRAME ADVANCE
KYBLIS
KEYBOARD LISTEN
TOPPAG
SETS X-Y COORD. FOR NEW PAGE
C

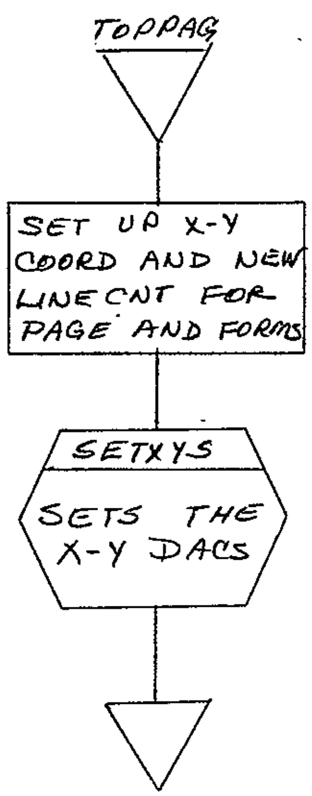

INXOUT
SETBYT
RESET BYTES
STARTX
CLEAR TTY INDEX
DETERMINE BEGINNING WORD AND BYTE IN BUFFER
P
BYT3WD
GET BYTE TO BE MOVED
S
BYTE TO BE STORED?
N
P
Y
STORE BYTE
Q
Q
ALL BYTES STORED?
R
INXDO
SAVE INFO FOR INDEX FRAME
RESTORE INSTRUCTION IN BYT3WD
R
BYT3WD
GET BYTE TO BE STORED
S

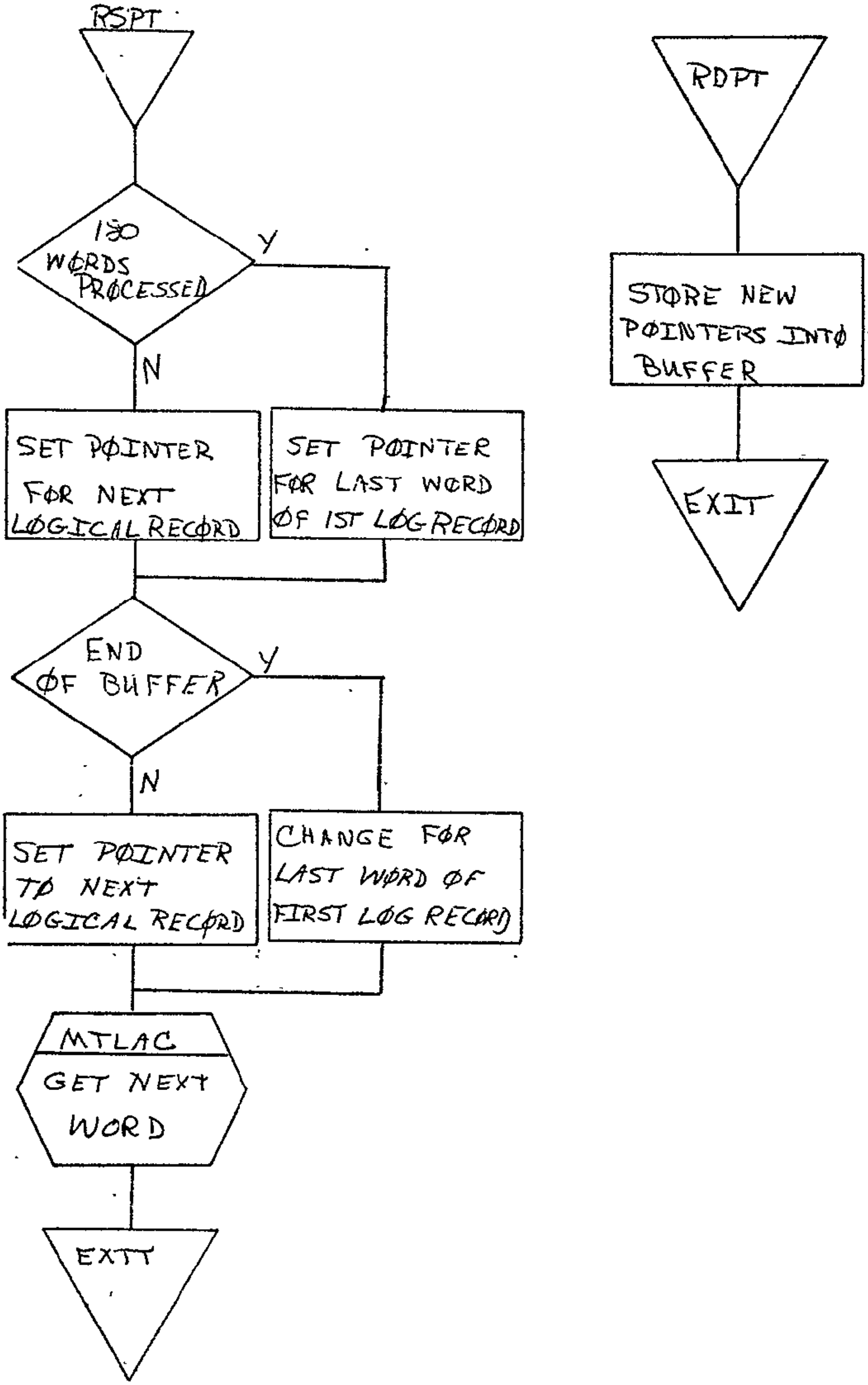

MVCOM
T
STORE CHAR IN BUFFER
V
END OF DATA
N
Y
BYT3WD
GET NEXT CHAR
T
BYT3WD
GET NEXT CHAR
STORE CHAR IN BUFFER
END OF TITLE
Y
N
U
U
BLANK CHAR
Y
N
END OF ALL MESSAGE
N
V
BYT3WD
GET THE NEXT CHAR
END OF RECORD
N
V
Y

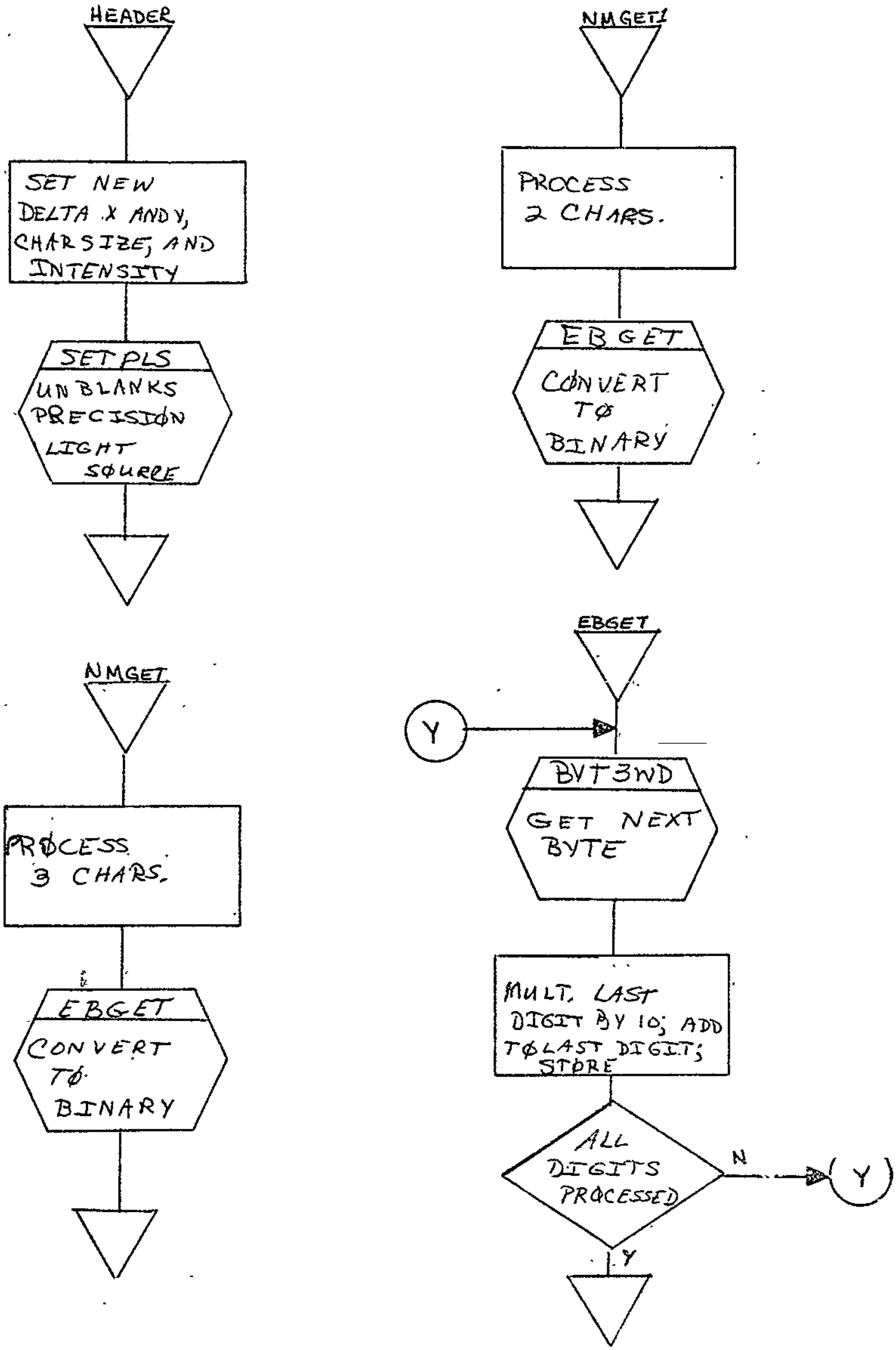

BYT3WD
ALL THREE BYTES PROCESSED
W
Y
SEPARATE BYTES AND STORE IN ONE WORD EACH. GET FIRST BYTE

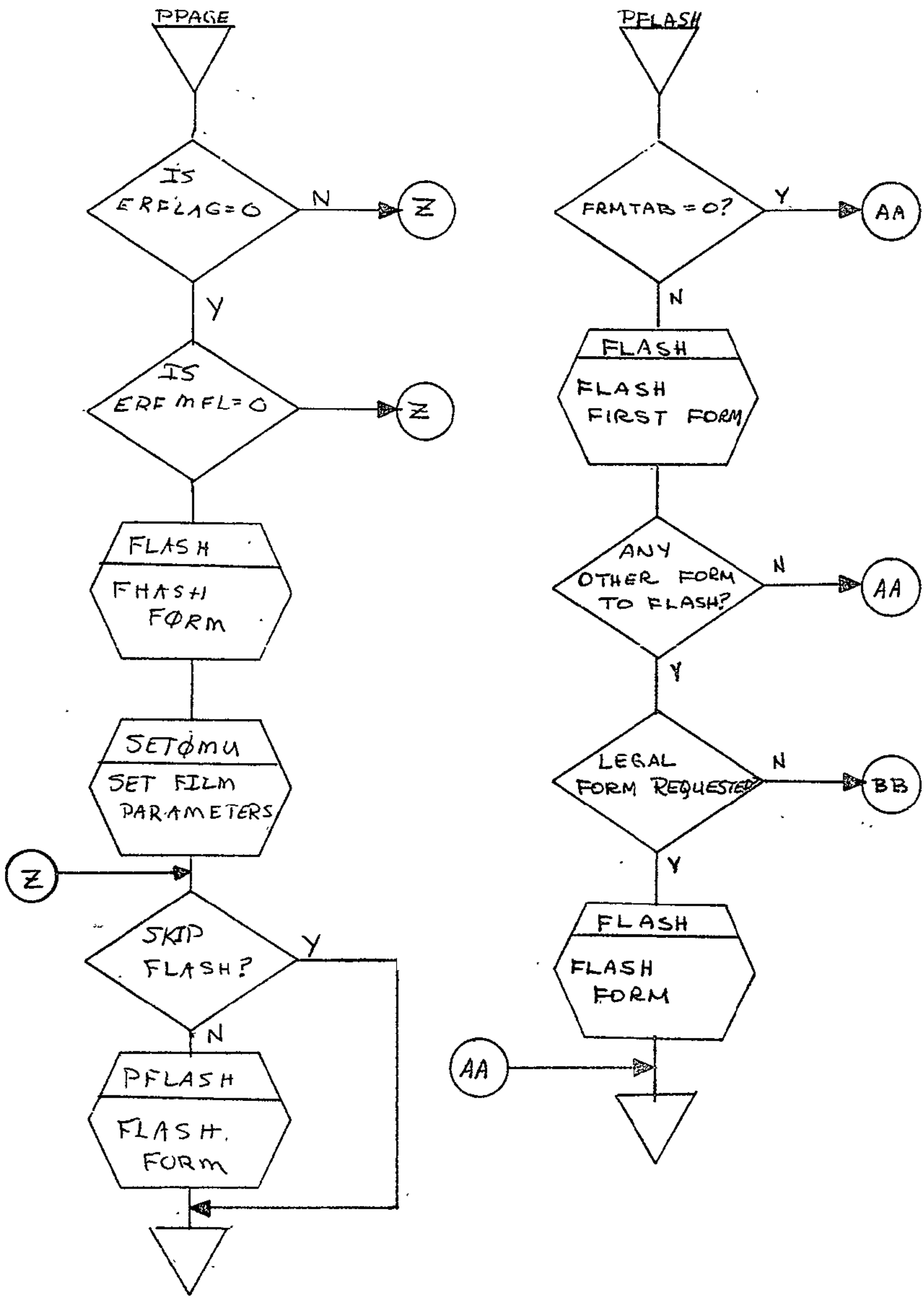

STARTX
SET SWITCH FOR INDEXING
SET UP COUNTER FOR NUMBER CHAR TO GET

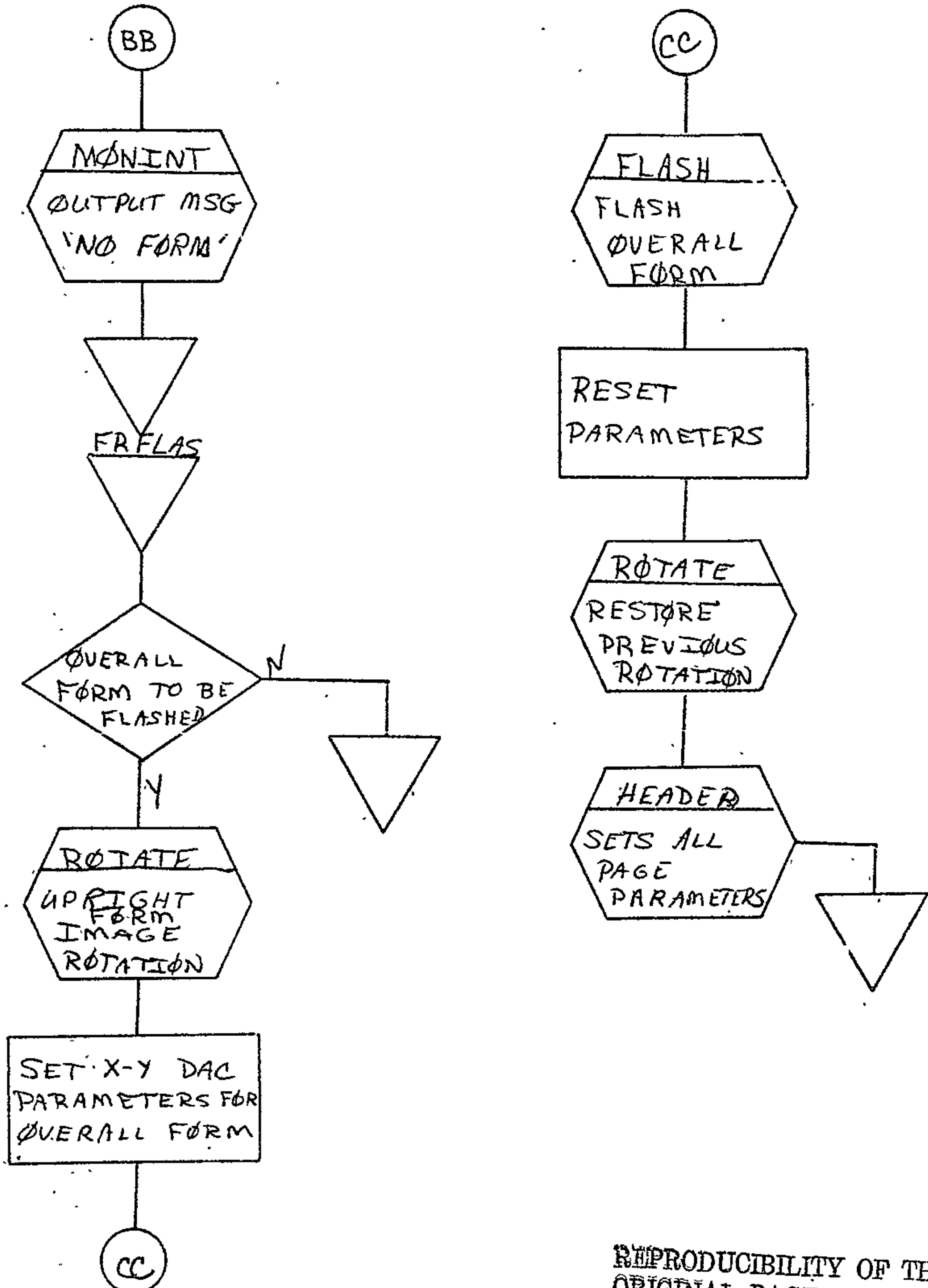

W
SECOND BYTE PROCESSED
Y
N
GET THIRD BYTE
GET SECOND BYTE


TOPPAG
SET UP X-Y COORD AND NEW LINECNT FOR PAGE AND FORMS
SETXYS
SETS THE X-Y DACS


RSPT
180 WORDS PROCESSED
Y
N
SET POINTER FOR NEXT LOGICAL RECORD
SET POINTER FOR LAST WORD OF 1ST LOG RECORD
END OF BUFFER
Y
N
SET POINTER TO NEXT LOGICAL RECORD
CHANGE FOR LAST WORD OF FIRST LOG RECORD
MTLAC
GET NEXT WORD
EXIT
RDPT
STORE NEW POINTERS INTO BUFFER
EXIT


HEADER
SET NEW DELTA X AND Y, CHARSIZE, AND INTENSITY
SETPLS
UNBLANKS PRECISIØN LIGHT SØURCE
NMGET
PRØCESS 3 CHARS.
EBGET
CONVERT TØ BINARY
NMGET1
PROCESS 2 CHARS.
EBGET
CØNVERT TØ BINARY
EBGET
Y
BVT3WD
GET NEXT BYTE
MULT. LAST DIGIT BY 10; ADD TØ LAST DIGIT; STØRE
ALL DIGITS PROCESSED
N
Y
Y


PPAGE
IS ERFLAG=0
N
Z
Y
IS ERFMFL=0
Z
FLASH
FHASH FØRM
SETØMU
SET FILM PARAMETERS
Z
SKIP FLASH?
Y
N
PFLASH
FLASH FORM
PFLASH
FRMTAB=0?
Y
AA
N
FLASH
FLASH FIRST FORM
ANY OTHER FORM TO FLASH?
N
AA
Y
LEGAL FORM REQUESTED
N
BB
Y
FLASH
FLASH FORM
AA


BB
MØNINT
ØUTPUT MSG
'NØ FØRM'
FRFLAS
ØVERALL
FØRM TO BE
FLASHED
N
Y
RØTATE
UPRIGHT
FØRM
IMAGE
RØTATIØN
SET X-Y DAC
PARAMETERS FØR
ØVERALL FØRM
CC
CC
FLASH
FLASH
ØVERALL
FØRM
RESET
PARAMETERS
RØTATE
RESTØRE
PREVIØUS
RØTATIØN
HEADER
SETS ALL
PAGE
PARAMETERS

2.12 COMA UNIVAC 494 PRINT PROCESSOR FOR 16 mm FILM (94UV16)

2.12.1 Background

A. Author. I. J. Morgan, Aeronutronic Ford Corp.

B. Intent. Requested when a Univac 494 print 7-track magnetic tape has been submitted for data to be output to microfilm (16 mm film). The requirements for this program are specified in SH-09864.

C. Program History

1. Production Tape Date. 6 June 1973
2. Author. I. J. Morgan
3. Authorization. EO-204F
4. Test Cases. TPS (JSC Form 1225) No. A1
5. Revisions. Reference Appendix B, paragraph B.12.

2.12.2 Introduction.

This paragraph describes the usage and design of the Univac 494 Print Processor for 16 mm film (94UV16). The MONITOR and associated I/O driven routines are described in SISO-TR531, Vol. I.

2.12.2.1 Hardware Requirements

- FR80 with 12K memory
- 7-track tape unit
- 16 mm camera.

2.12.2.2 Software Requirements.

The following files from I.I.I. SYM Directory are required.

III109	III185	III162	III187
III166	III163	III161	FLOAD
III164	III147	III161 GO	

2.12.2.3 Assembly Parameters. The assembly parameters in III10^ should be set for the proper machine configuration. Assembly parameters specific to the 94UVI6 Print Processor are as follows

A. MTNOIS. Defines code to throw away short noise records.

B. 7-TRACK. If 1, indicates data will be coming from a 7-track tape drive.

C. MUMBLE. If 1, indicates system configuration for output to the teletype.

D. CAMNUM. If 2, indicates the 16 mm unsprocketed camera is being used.

E. PTYPE. If 1, ensures compatibility with BCD forms.

F. ALLOW. Defines code to allow form loading and flashing.

G. NUMCAM. If 6, facilitates camera change at run time from the 16 mm to 35 mm camera.

H. TWOBUF. If 1, gives two magnetic tape buffers for higher throughput.

I. BIGBUF. If 0, allows maximum amount of features with minimum buffer space.

J. MTPTR. If 10, assigns the active buffer address to auto-index register 10.

K. MTSIZE. Magnetic tape buffer size.

L. MTTSIZ. Teletype buffer size.

M. FTYPE. Indicator for 16 mm camera.

N. DASHED. If 1, defines dashed lines.

O. CIRCLE. If 1, allows arcs.

P. UNIVAC. If 1, defines the Univac Fieldata character set.

2.12.2.4 <u>Operator Commands.</u> The following commands are available for use, and can be modified.

```
*
*TIME=2'58.6'
*FRAME=0
*CURRENT PAGE=0
*GO
*CONTINUE
*MAKE FILM=1
*CLEAR
*ADVANCE
*TAPE TYPE - 2,5 OR 8=8
*BACK
*PARITY=1
*USE=2
*REWIND
*SKIP
*TRY AGAIN=10
*FORM=   NULL   16FRM1   16FRM2   16FRM3   16FRM4
*ERROR FORM=NO
*HITS-CHARS,VEC,PTS=1,1,1
*FOCUS
*CAMERA=2
*PULLDOWN=6
*LOAD-94UV16
*ROTATION=0
*
```

2.12.3 Analysis

2.12.3.1 Major Control Section

A. Description. This program is requested to be run by the operator when a 494 print tape is to be output to 16 mm film. The program is called by MONITOR (III166) through the subroutine PSTART. Data is read into core from the tape by the double buffer process using MTRINI, a subroutine in III163. A buffer area of 360 words is reserved for this read. There are four logical records of 45 words each in each physical record of 180 words (see figure 2-2). The camera is advanced to the next frame to assure that no overwriting occurs.

The first and second words of the first logical record are examined. If this is a job separator control record, the program goes to the JOBREC Routine. If not, the error message CONTROL ERROR is output and control is given back to MONITOR. JOBREC is executed when a job separator record is found. The job information to be output on the first two frames is stored in TTYBUF. Then JOBNM outputs this information on film in eyeball-sized characters, three characters per frame. The ROTATE Subroutine in III166 is called to restore any rotation indication. NEXPAG is called to flash any forms, advance to the next frame, set the coordinates for the new frame, position the CRT beam, and reset the line count for 64 lines per page. The next logical record is then analyzed. If this is another control record, the program goes to the appropriate control routine, as described below, skipping any title control records. Otherwise, the record is output as print data by the routine DATREC.

FRMREC is called when a form control record has been encountered. The form number is found in the first byte of the third word of this record by the subroutine BYT3WD. It is stored in the location FRMNUM. If a form was requested greater than four, the message ILLEGAL FORM is output to the teletype, and the program returns to process the next record, after storing a zero in FRMNUM. If the form number is zero, FLASSW is set so that a form will not be flashed.

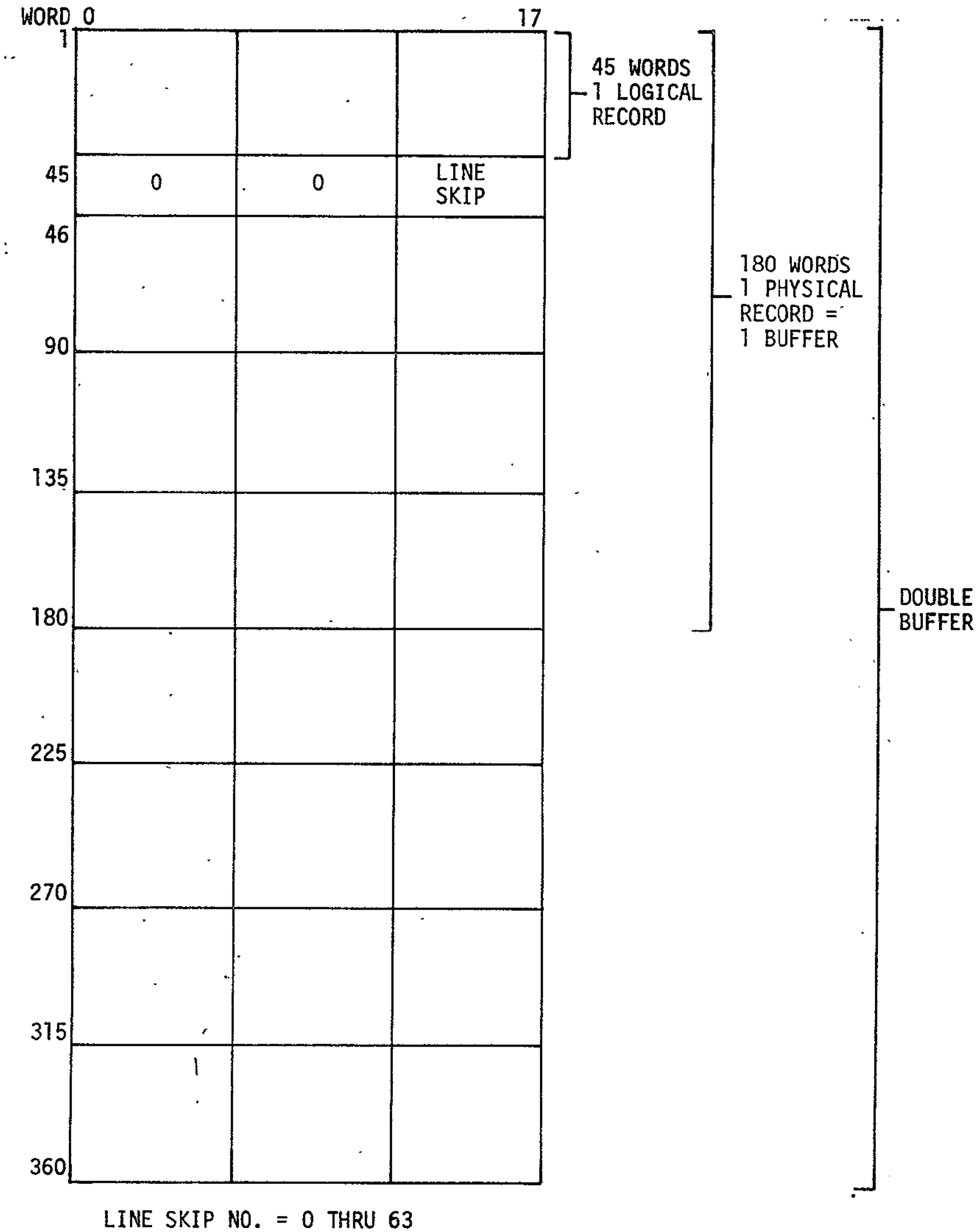


Figure 2-2 94UV16 Buffer Area

When an image orientation record is encountered, the ROTREC Routine decodes the record, saves the setting in locations ROTCOM and SAVROT, and calls ROTATE to appropriately set the DAC's recording in CINE or COMIC mode. The subroutines HEADER and TOPPAG are called to reset parameters for the new mode.

DATREC is called when print data is found. The latest X and Y coordinates are set by a call to the SETXYS Subroutine. A total of 132 characters are output. The line skip number is found in the last word of the logical record. The number of carriage returns executed is equal to this number plus one, with the line count number, LNCNT, being decremented each time. When 64 lines of data have been output, a flag is set to cause the forms to flash, and the subroutine NEXPAG is called to flash the forms, advance the page, and reset the X and Y coordinates for the new page.

After processing each data record, the program returns to pick up the next logical record. The program continues until an end-of-job, end-of-tape control record is encountered. The end-of-job, end-of-tape control record is encountered when all the jobs on a single or multiple tapes have been processed. The ENDALL Routine is called to process this record. Flags are set to cause the DOUBLE END-OF-FILE message to be output. NEXPAG is called to flash the form on the last page, if one is present, and to finish the last page. The program then goes to the subroutine MTEOFF which goes to MONITOR and types out DOUBLE-END-OF-FILE.

B. Input/Output

1. Input. Data is input from a 7-track tape drive in logical units of 45 words each and in physical records of 180 words each.

2. Output. Output of data is to 16 mm or 35 mm film. Each frame contains one page, having a maximum of 64 lines per page with a maximum of 132 characters per line

3. Error Message Output

a. CONTROL ERROR. This is output when the first logical record of a job is not a control record.

b. ILLEGAL FORM. This is output when a form number greater than four has been requested.

c. NO FORM. This is output when the form number is equal to zero and the FLASSW has not been properly set to prevent the logic from reaching this point.

C. Linkages

1. External

Routine	Program	Calling Sequence
MTLAC	III163	JMS MTLAC
MTRINI	III163	JMS MTRINI
FRSPIC	III166	FRSPIC
KYBLIS	III166	JMS KYBLIS
MCRLF	III166	JMS MCRLF
MMESSG	III166	JMS MMESSG
MONINT	III166	JMS MONINT
MONOUX	III166	JMP MONOUX
MTEOFF	III166	JMS MTEOFF
NEXPIC	III166	NEXPIC
ROTATE	III166	JMS ROTATE
SETOMU	III166	SETOMU
SETPLS	III166	SETPLS
SETXYS	III166	JMS SETXYS LAC X-COORDINATE LAC Y-COORDINATE
FLASH	III187	LAC (FORM ADDRESS) DAC FRMPTR FLASH
PSTLL	III166	PSTLL
DRWCHR	III162	LAC (CHARACTER) JMS DRWCHR LAC X-COORDINATE LAC Y-COORDINATE
XXXXXX	III162	LAC X-COORD XXXXXX
YYYYYY	III162	LAC Y-COORD YYYYYY
ROTTST	III187	JMS ROTTST

2. Internal

Routine	Calling Sequence
BYT3WD	JMS BYT3WD
	LAC TEMP (NO. OF CHAR)
EBGET	JMS EBGET
HEADER	JMS HEADER
	LAC MQ
MVCOM	JMS MVCOM
NMGET	JMS NMGET
NMGET1	JMS NMGET1
PFLASH	PFLASH
PPAGE	PPAGE
RDPT	JMS RDPT
RSPT	JMS RSPT
SETBYT	JMS SETBYT
TOPPAG	TOPPAG
JOBNM	JMS JOBNM
NEXPAG	NEXPAG
FRFLAS	FRFLAS

2.12.3.2 Subroutines

A. BYT3WD. Used to access one particular byte in a word. Prior to BYT3WD being called the first time, SETBYT has been called to set flags to indicate that none of the three bytes have yet been processed. When none of the flags are set, the next word in the buffer is obtained. The word is divided into bytes with bits 0-5 being stored in word location UBYTE, bits 6-11 in word location UBYT1, and bits 12-17 in UBYT2. UBYTE is then passed to the calling routine. The next time BYT3WD is called, UBYT1 will be passed, and on the third call, UBYT2 will be passed unless SETBYT has been requested to reset these flags.

B. EBGET. Called by NMGET and NMGET1, which store the number of bytes to be converted in the location TEMP. EBGET calls BYT3WD to obtain each byte. The byte is converted from Fieldata to binary and added to the last digit converted, if this is not the first. EBGET continues to process bytes until all the bytes have been converted.

C. <u>HEADER</u>. Called at the beginning of a job to set the X delta, the Y delta, the character size, the intensity, and the spot size.

D. <u>MVCOM</u>. Moves data for the job separator record and the title record into TTYBUF. It is entered with the first character in the MQ, and processes bytes until a slash is encountered.

E. <u>NMGET</u>. Sets count for EBGET to process three Fieldata characters.

F. <u>NMGET1</u>. Sets count for EBGET to process two Fieldata characters.

G. <u>PFLASH</u>. Called by PPAGE to flash the null and any requested form if loaded. When entered, it is determined if the FRMTAB, which contains the addresses to the forms, contains all zeros. If so, the program jumps to an error exit (NO FORM). If not, the address is obtained and FLASH is called to flash the form.

H. <u>PPAGE</u>. Called by NEXPAG to determine if a form is to be flashed. If any characters were printed on the page, the program goes to PFLASH. If not, the program exists.

I. <u>RDPT</u>. Saves the count, MTCNT, and the address pointer, MTPTR, in the buffer.

J. <u>RSPT</u>. Restores MTCNT and MTPTR to point to the next word to be processed.

K. <u>SETBYT</u>. Resets the flags for bytes to be processed by BYT3WD.

L. <u>TOPPAG</u>. Resets the line number to 1, resets the page count to default size, and resets the X and Y DAC's to their starting page position.

M. <u>JOBNM</u>. Outputs the six characters of job information in the teletype buffer to film in eyeball-sized characters, three characters per frame.

N. NEXPAG. Flashes all appropriate forms (including the cut-mark), advances the camera to the next page (NEXPIC), and resets all page parameters (TOPPAG).

2.12.3.3 Constants and Variables

A. Internal

1. BUFFER. Area reserved for two physical records of 180 words each.

2. CURBUF. Word containing the address of the buffer currently being used.

3. DBLADR. Address of message DOUBLE END OF FILE.

4. ERFLAG. Flag that, when set to zero, indicate the error form flag is to be checked.

5. ERFMFL. Error form flag.

6. FLASSW. Location in the program used to determine if a form is to be flashed.

7. FXLEFT. Location containing the beginning raster point (X coordinate) for a form.

8. FYTOP. Location containing the beginning raster point (Y coordinate) for a form.

9. FRMINP. Contains address of first form.

10. FRMNUM. Contains the number of the form to be flashed.

11. FRMPTR. Address of form to be flashed.

12. FRMTAB. Six-word table with each word giving the beginning address of a form.

13. LEFTXX. Location containing the beginning X coordinate for a line of print.

14. LEFTX. Location containing the beginning X coordinate for a line of print.

15. LENGTH. Word giving half the total buffer size (a negative number).

16. LNCNT. Word containing the number of lines that are left to be output for this page (negative number).

17. LNFDNM. Number of scope points to advance to the next line (negative).

18. NEWTOP. Location containing the Y coordinate of the line to be output.

19. NEXBUF. Word containing the address of the next buffe to be used.

20. RDCNT. Location used to save MTCNT.

21. RDPTR. Location used to save MTPTR.

22. SAV12. Temporary save location used in subroutine JOBNM.

23. SAV13. Temporary save location used in subroutine JOBNM.

24. SAVIRM. Temporary location.

25. SAVROT. Location containing a zero or one to indicate present rotation.

26. SPCNUM. Location containing the raster size for the X coordinate.

27. TEMP. Temporary reserve location.

28. TOPYY. Location containing the beginning raster point (Y coordinate) for all pages.

29. TOPY. Location containing the beginning raster point (Y coordinate) for all pages.

30. UBYTE. Location used to store bits 0-5 of a particular word.

31. UBYT1. Location used to store bits 6-11 of a particular word.

32. UBYT2. Location used to store bits 12-17 of a particular word.

33. VCHAR. Location used to store digits temporarily until all numbers have been processed.

B. External

1. PBUFSZ. Length of a single buffer.

2. MTCNT. Location containing the number of words yet to be processed (negative number).

3. MTPTR. Location containing the address of the word in the buffer to be processed next.

4. CHDELX. Word used to set the delta X.

5. CHDELY. Word used to set the delta Y.

6. CHSIZ. Word containing the character si

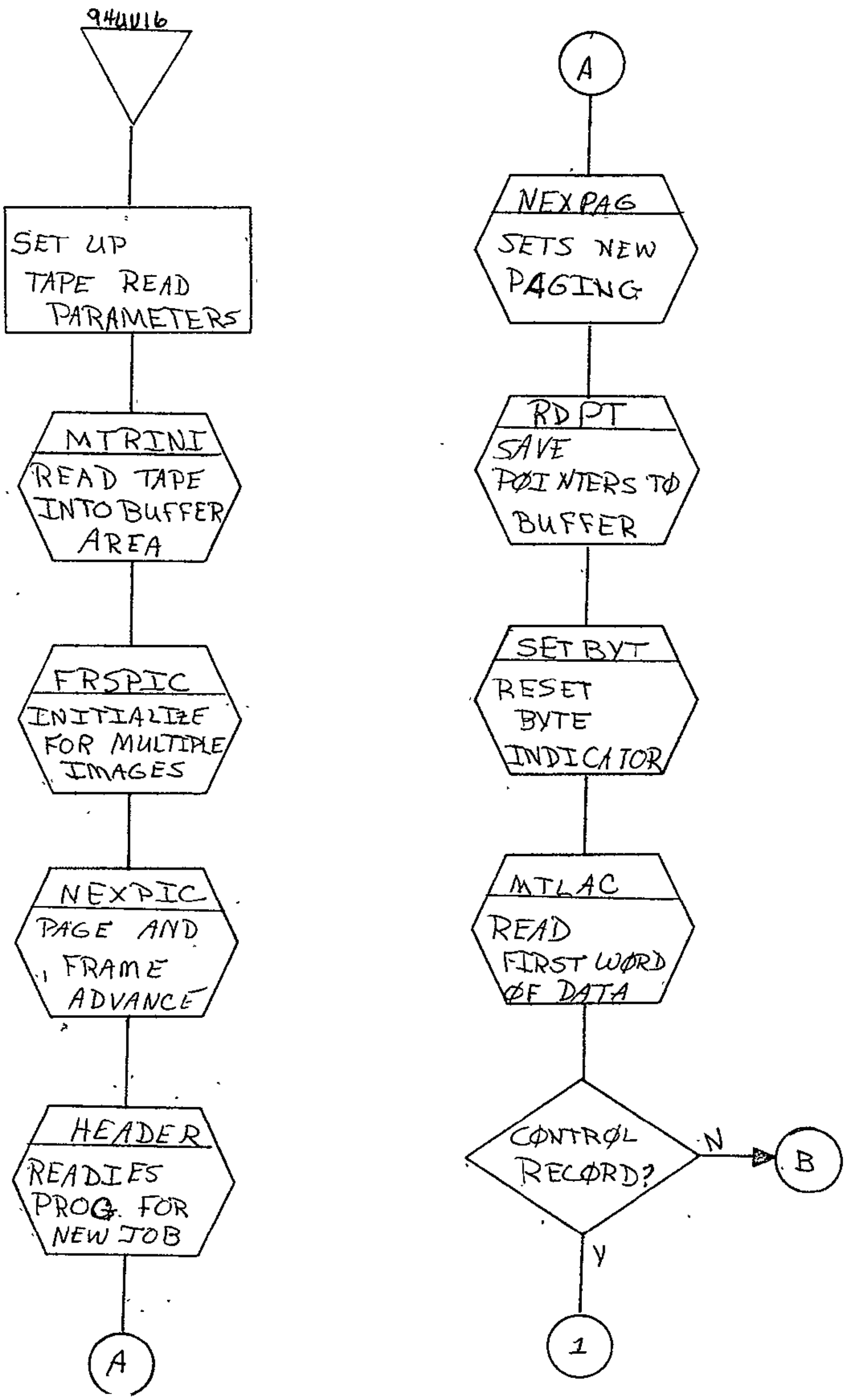
7. RECPIN. Word containing the intensity.

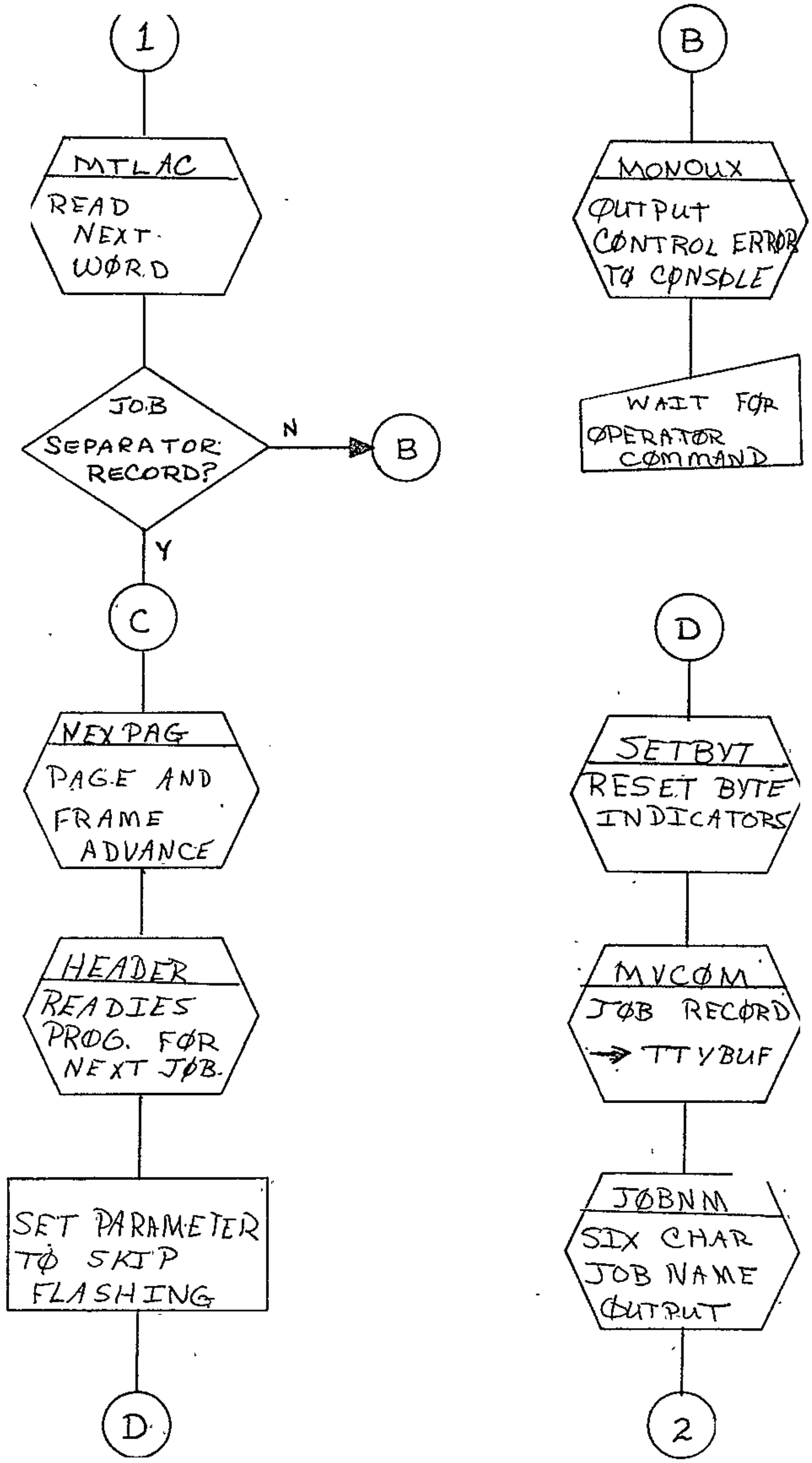
8. RECSPT. Word containing the spot size.

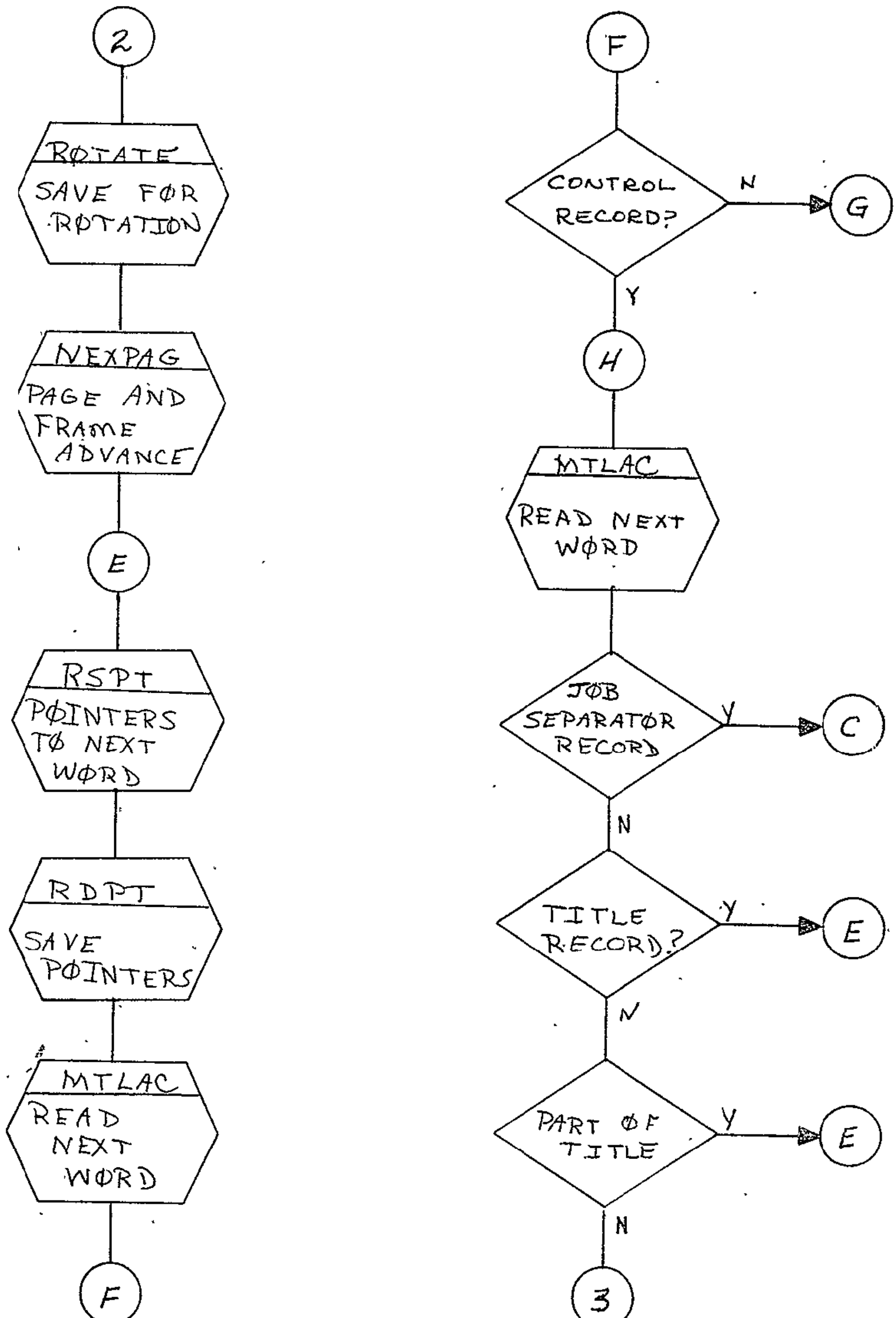
9. FCXP. Contains beginning X coordinate of character to be drawn on a frame in the subroutine DRWCHR.

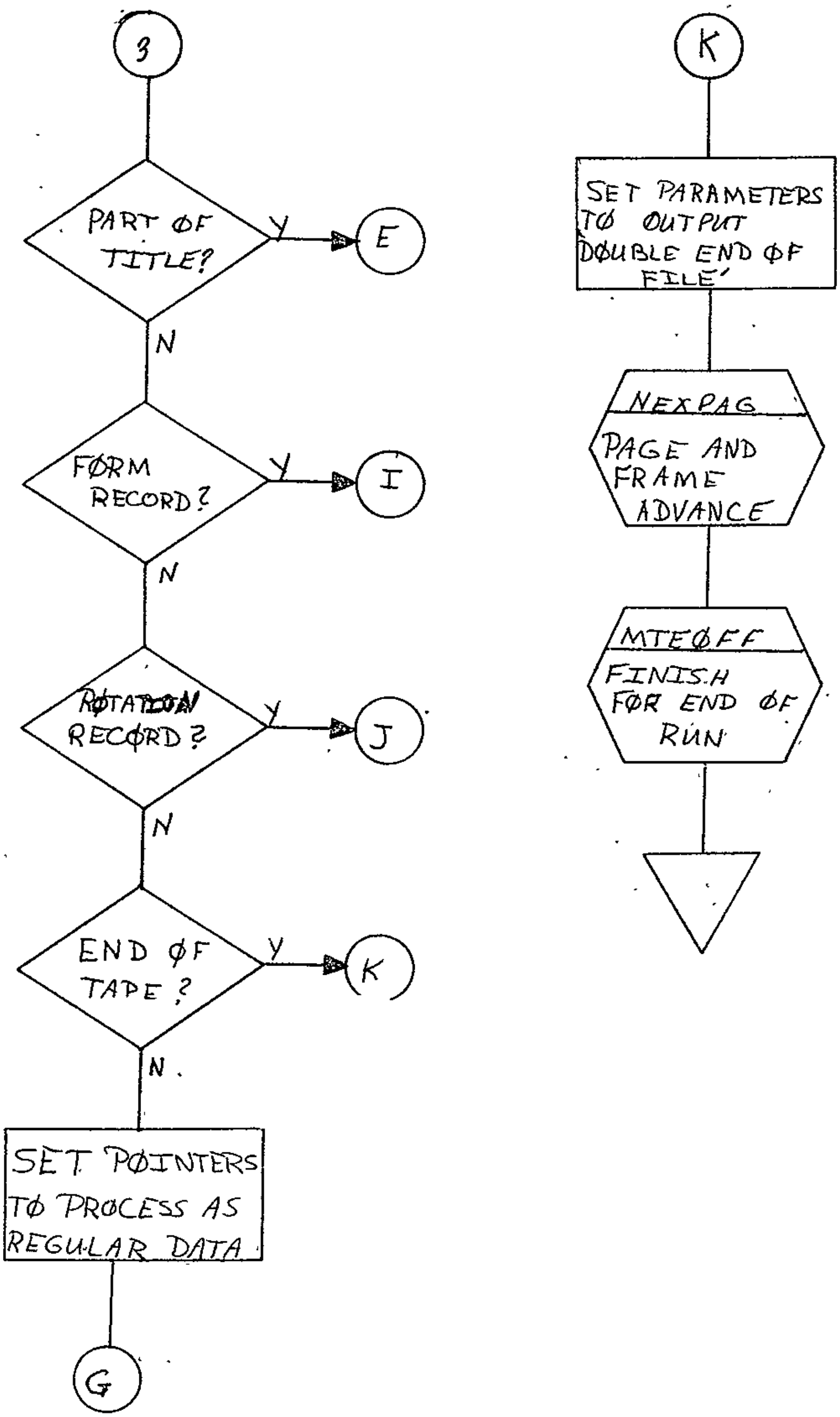
10. FCYP. Contains the beginning Y coordinate of character to be drawn by subroutine DRWCHR.

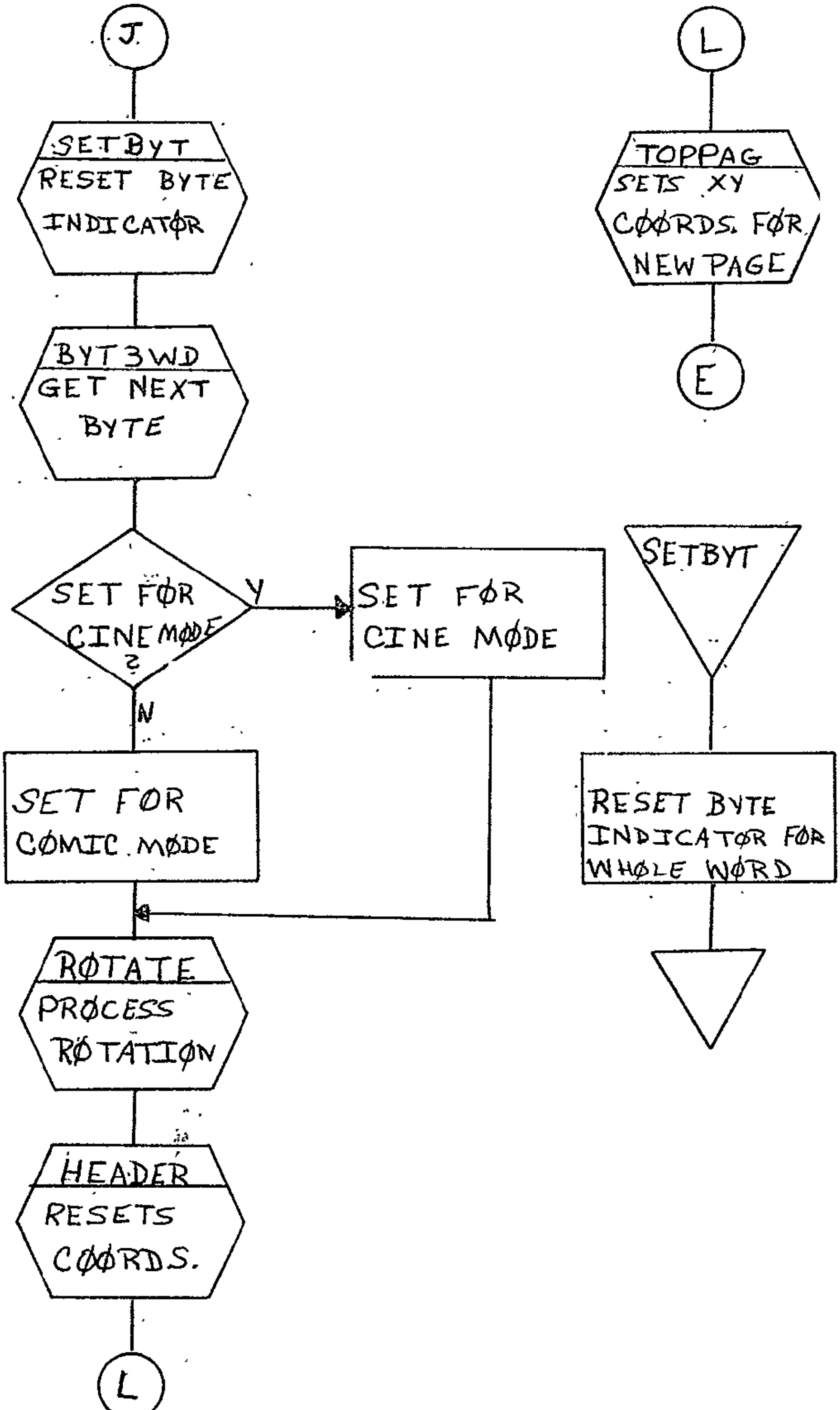
2.12.3.4 Flow Charts. See following pages.

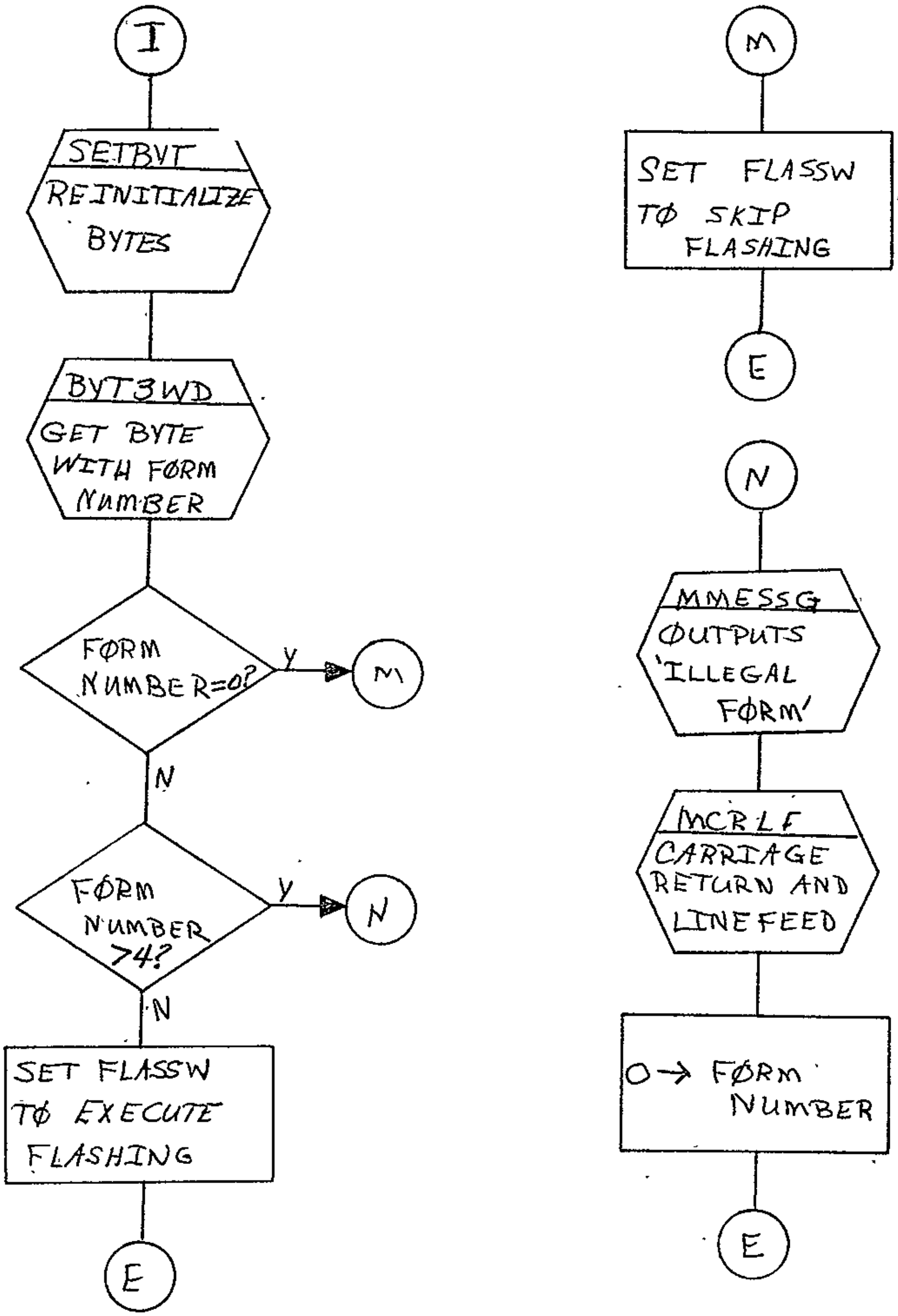

944V16
SET UP TAPE READ PARAMETERS
MTRINI
READ TAPE INTO BUFFER AREA
FRSPIC
INITIALIZE FOR MULTIPLE IMAGES
NEXPIC
PAGE AND FRAME ADVANCE
HEADER
READIES PROG. FOR NEW JOB
A
A
NEXPAG
SETS NEW PAGING
RDPT
SAVE POINTERS TO BUFFER
SETBYT
RESET BYTE INDICATOR
MTLAC
READ FIRST WORD OF DATA
CONTROL RECORD?
N
B
Y
1

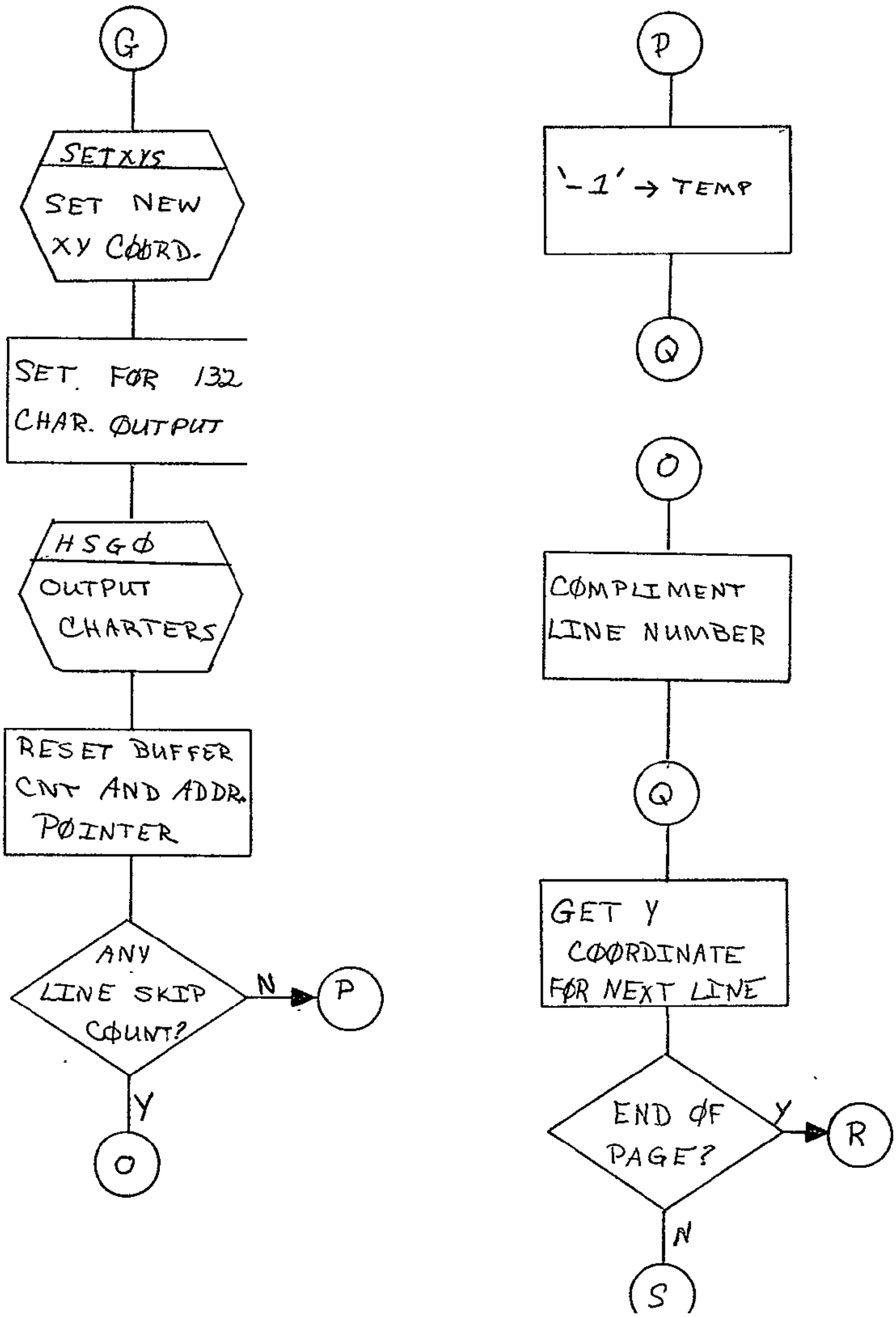

1
MTLAC
READ NEXT WØRD
JOB SEPARATOR RECORD?
N
B
Y
C
NEXPAG
PAGE AND FRAME ADVANCE
HEADER
READIES PRØG. FØR NEXT JØB.
SET PARAMETER TØ SKIP FLASHING
D
B
MONOUX
ØUTPUT CØNTROL ERROR TØ CØNSØLE
WAIT FØR ØPERATØR CØMMAND
D
SETBYT
RESET BYTE INDICATORS
MVCØM
JØB RECØRD → TTYBUF
JØBNM
SIX CHAR JOB NAME ØUTPUT
2

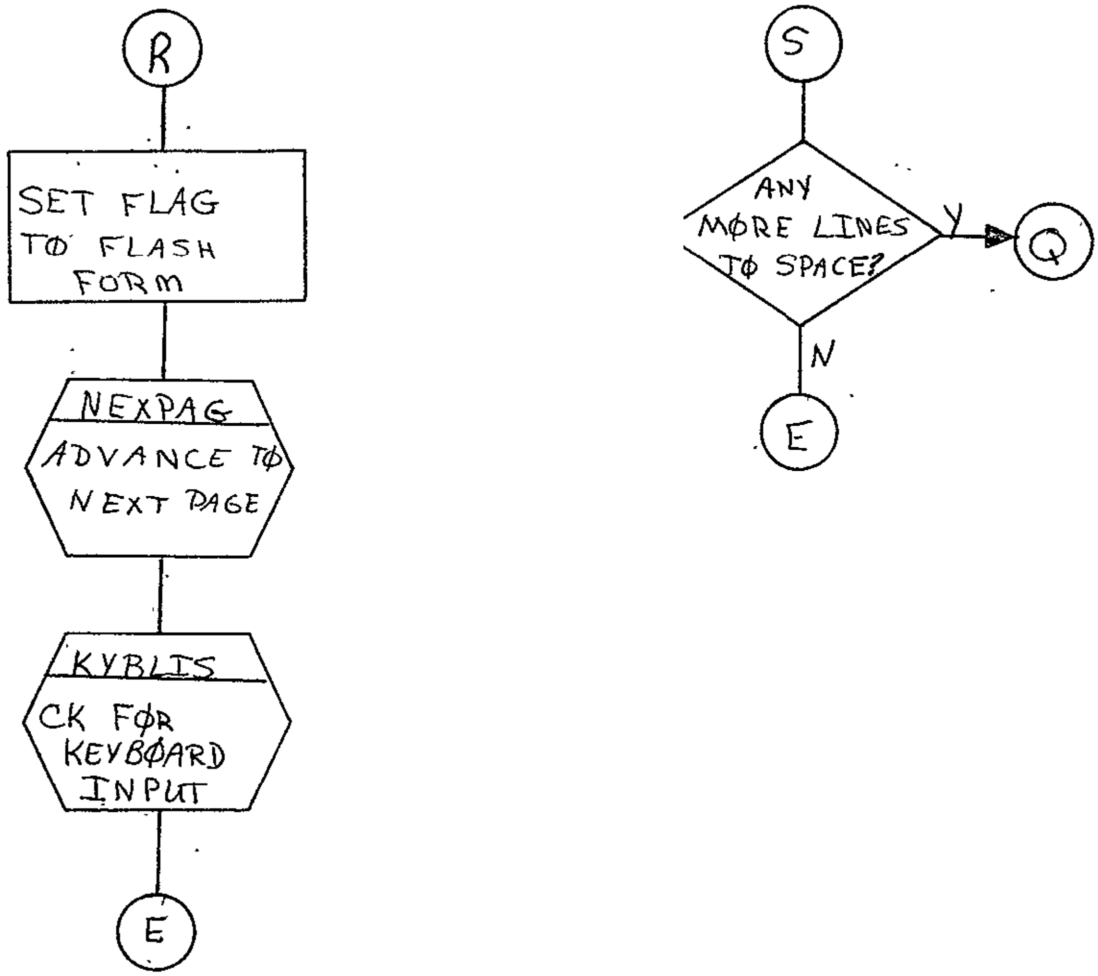

2
RØTATE
SAVE FØR ROTATION
NEXPAG
PAGE AND FRAME ADVANCE
E
RSPT
PØINTERS TØ NEXT WØRD
RDPT
SAVE PØINTERS
MTLAC
READ NEXT WØRD
F
F
CONTROL RECORD?
N
G
Y
H
MTLAC
READ NEXT WØRD
JØB SEPARATØR RECORD
Y
C
N
TITLE RECORD?
Y
E
N
PART ØF TITLE
Y
E
N
3

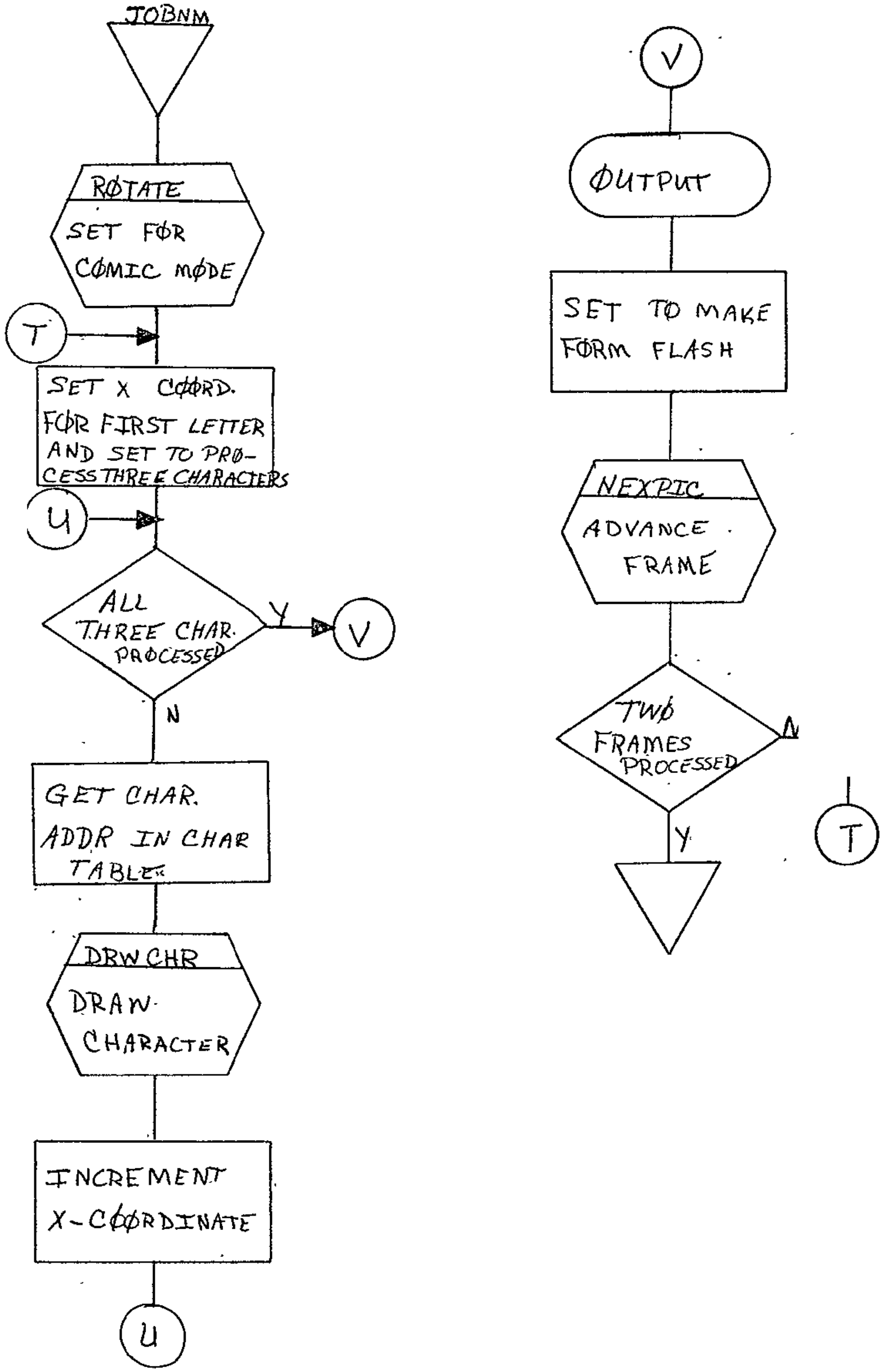

3
PART ØF TITLE?
Y
E
N
FØRM RECORD?
Y
I
N
RØTATIØN RECØRD?
Y
J
N
END ØF TAPE?
Y
K
N
SET PØINTERS TØ PROCESS AS REGULAR DATA
G
K
SET PARAMETERS TØ OUTPUT DØUBLE END ØF FILE
NEXPAG
PAGE AND FRAME ADVANCE
MTEØFF
FINISH FØR END ØF RUN

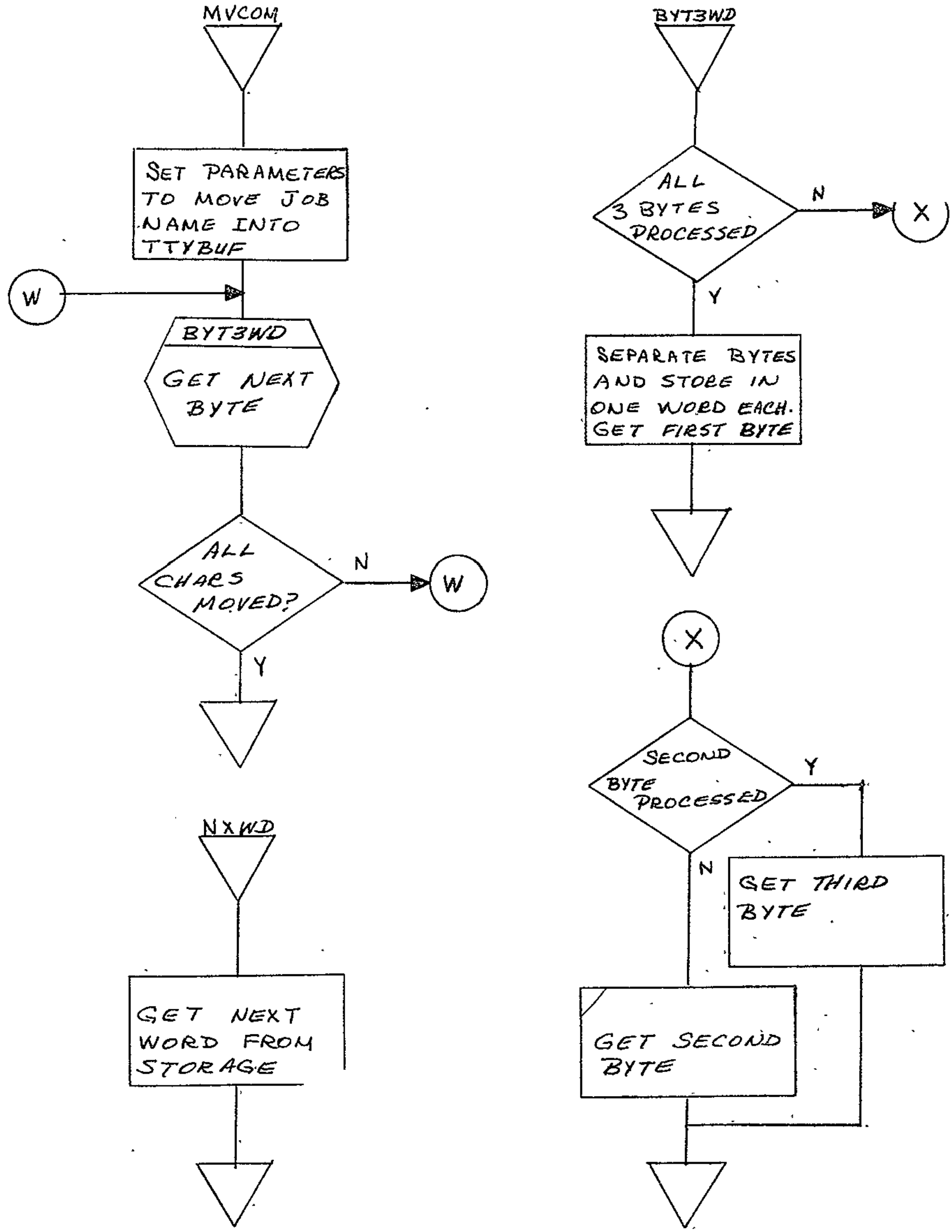

J
SETBYT
RESET BYTE INDICATOR
BYT3WD
GET NEXT BYTE
SET FOR CINE MODE ?
Y
N
SET FOR CINE MODE
SET FOR COMIC MODE
ROTATE
PROCESS ROTATION
HEADER
RESETS COORDS.
L
L
TOPPAG
SETS XY COORDS. FOR NEW PAGE
E
SETBYT
RESET BYTE INDICATOR FOR WHOLE WORD

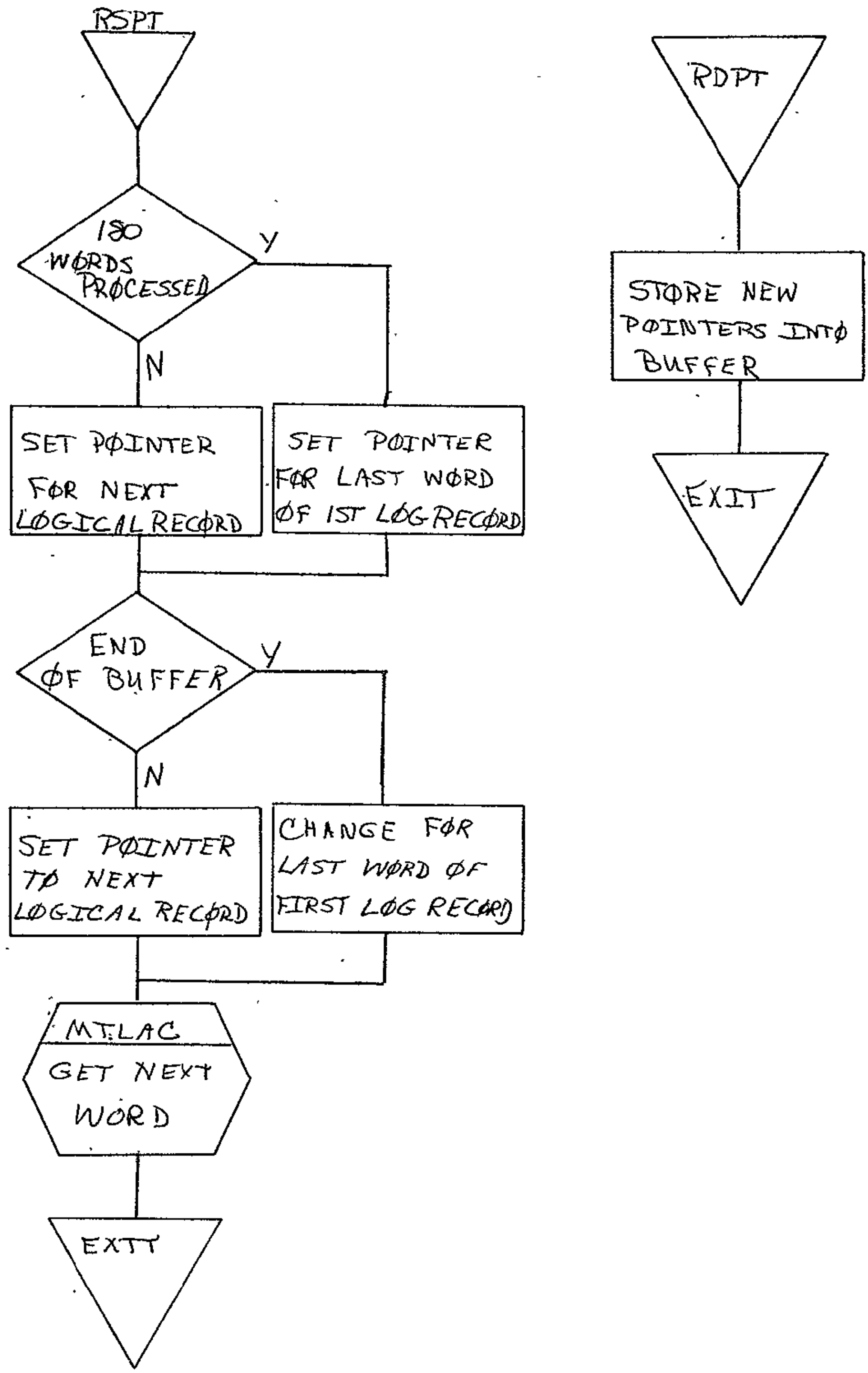

I
SETBVT
REINITIALIZE BYTES
BYT3WD
GET BYTE WITH FØRM NUMBER
FØRM NUMBER=0?
Y
M
N
FØRM NUMBER 74?
Y
N
N
SET FLASSW TØ EXECUTE FLASHING
E
M
SET FLASSW TØ SKIP FLASHING
E
N
MMESSG
ØUTPUTS 'ILLEGAL FØRM'
MCRLF
CARRIAGE RETURN AND LINE FEED
0 → FØRM NUMBER
E

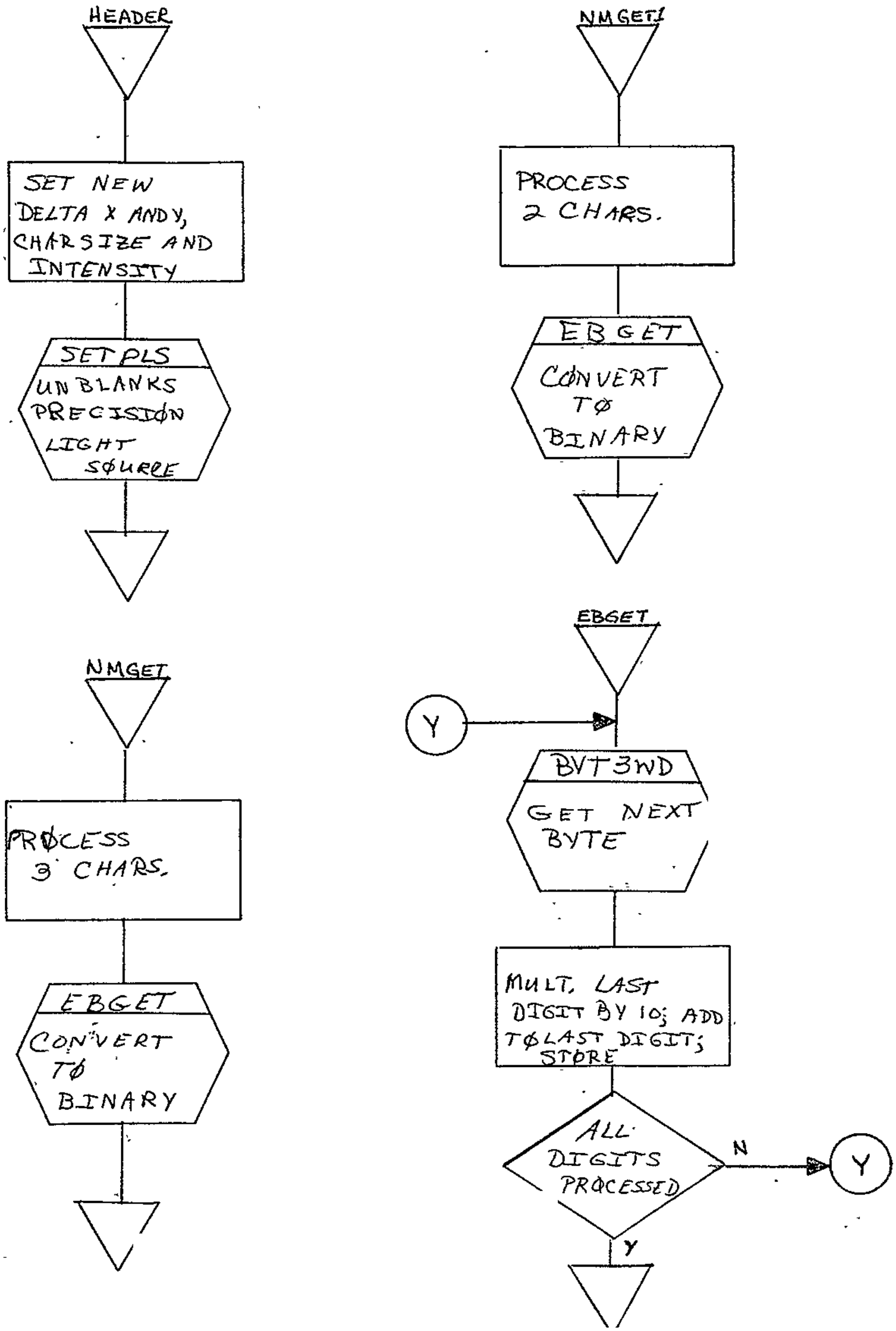

G
SETXYS
SET NEW XY CØØRD.
SET FØR 132 CHAR. ØUTPUT
HSGØ
OUTPUT CHARTERS
RESET BUFFER CNT AND ADDR. PØINTER
ANY LINE SKIP CØUNT?
N
P
Y
O
P
'-1' → TEMP
Q
O
CØMPLIMENT LINE NUMBER
Q
GET Y CØØRDINATE FØR NEXT LINE
END ØF PAGE?
Y
R
N
S

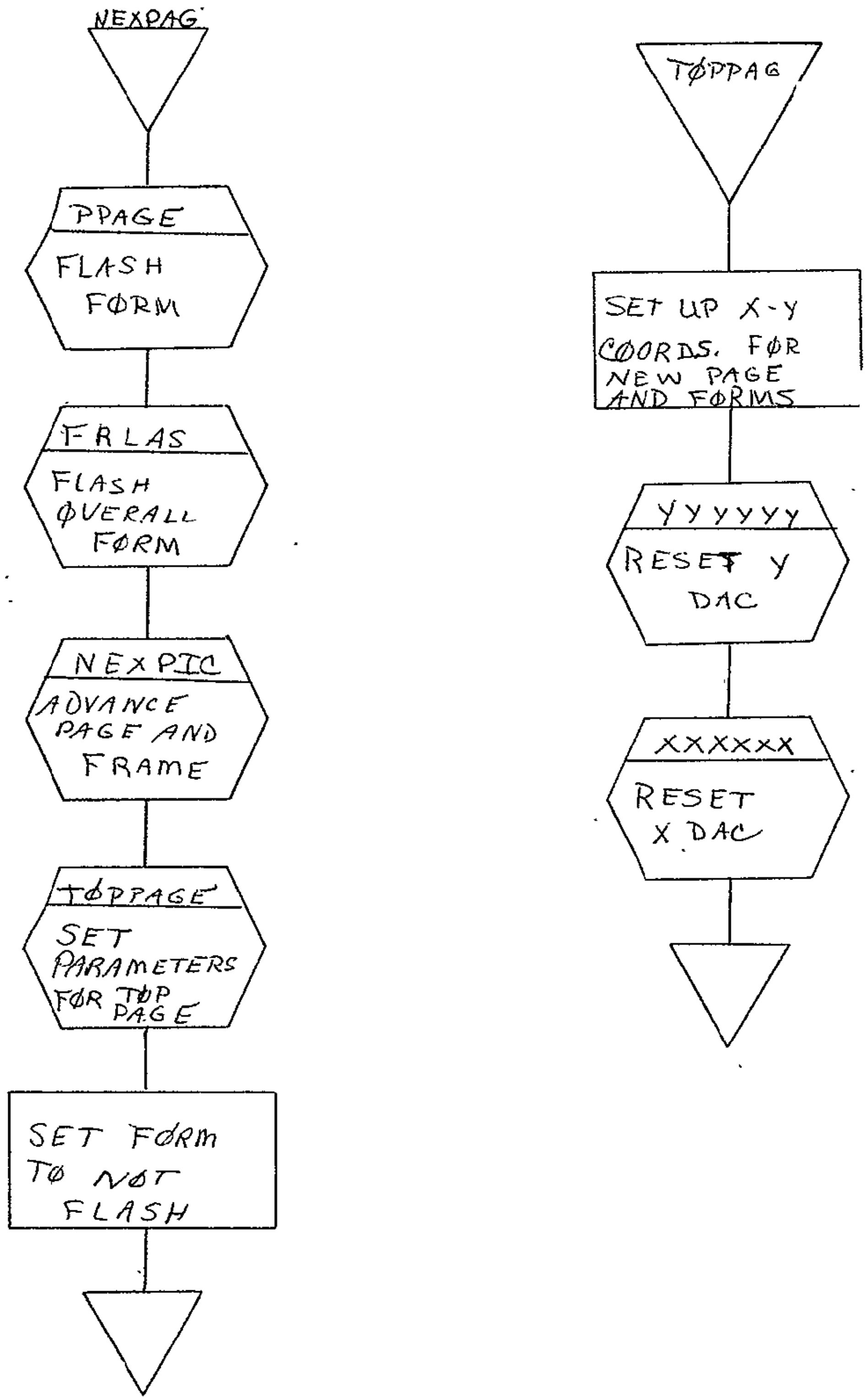

R
SET FLAG TØ FLASH FORM
NEXPAG
ADVANCE TØ NEXT PAGE
KYBLIS
CK FØR KEYBØARD INPUT
E
S
ANY MØRE LINES TØ SPACE?
Y
Q
N
E

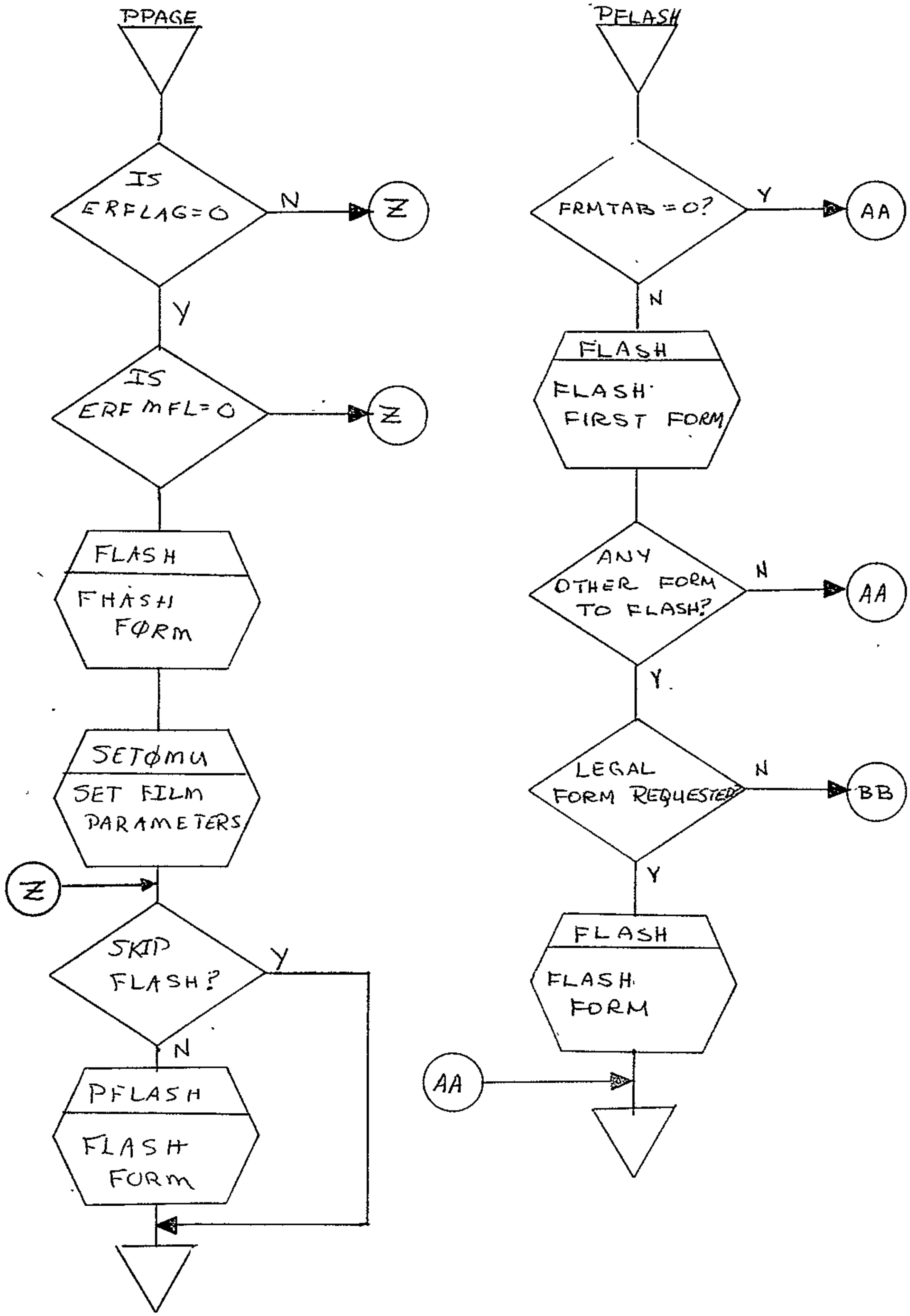

JOBNM
RØTATE
SET FØR
CØMIC MØDE
T
SET X CØØRD.
FØR FIRST LETTER
AND SET TO PRØ-
CESS THREE CHARACTERS
U
ALL
THREE CHAR.
PROCESSED
Y
V
N
GET CHAR.
ADDR IN CHAR
TABLE
DRWCHR
DRAW
CHARACTER
INCREMENT
X-CØØRDINATE
U
V
ØUTPUT
SET TO MAKE
FØRM FLASH
NEXPIC
ADVANCE
FRAME
TWØ
FRAMES
PROCESSED
N
Y
T

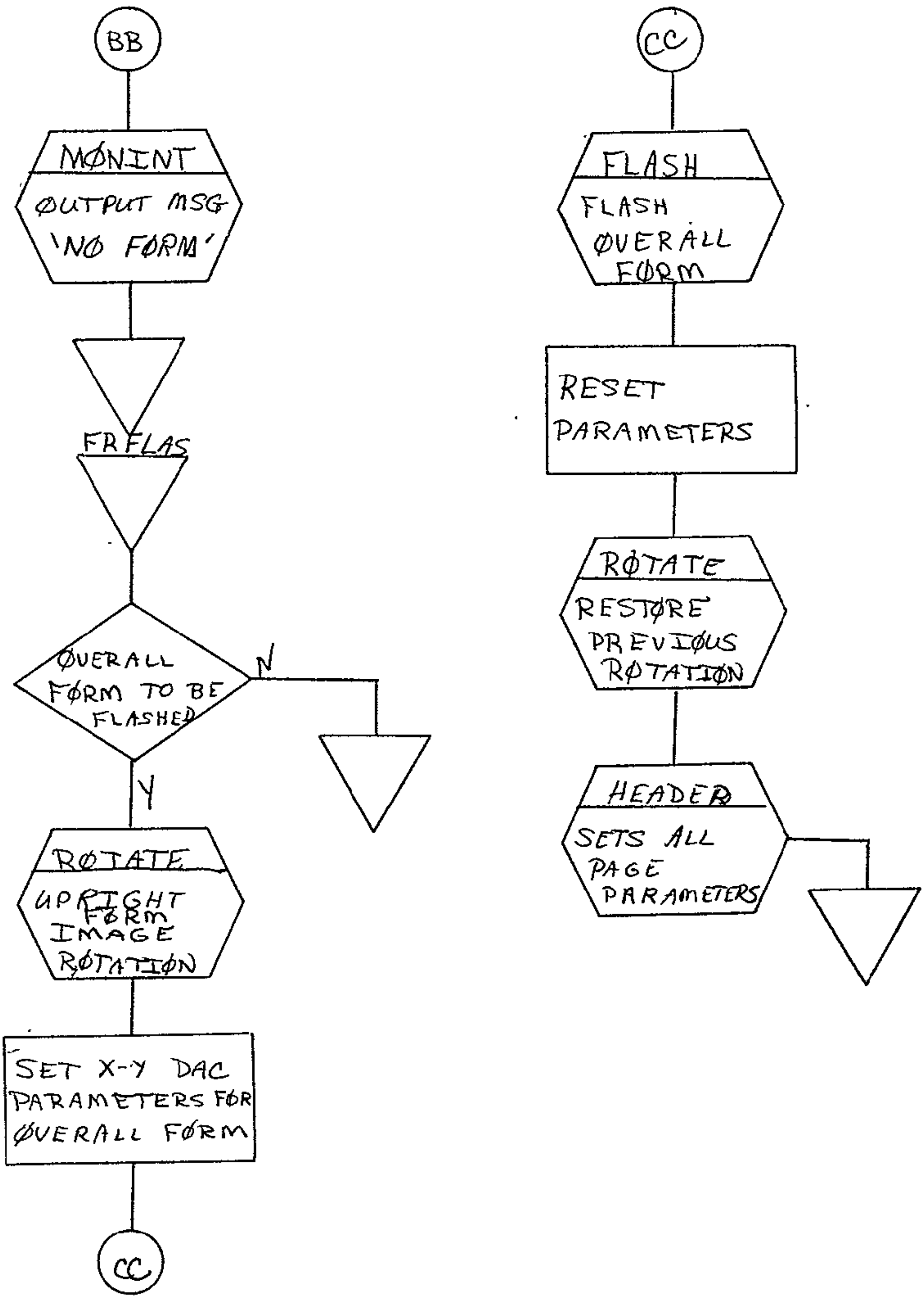

MVCOM
SET PARAMETERS TO MOVE JOB NAME INTO TTYBUF
W
BYT3WD
GET NEXT BYTE
ALL CHARS MOVED?
N
W
Y
NXWD
GET NEXT WORD FROM STORAGE
BYT3WD
ALL 3 BYTES PROCESSED
N
X
Y
SEPARATE BYTES AND STORE IN ONE WORD EACH. GET FIRST BYTE
X
SECOND BYTE PROCESSED
Y
N
GET THIRD BYTE
GET SECOND BYTE


RSPT
180 WORDS PROCESSED
Y
N
SET POINTER FOR NEXT LOGICAL RECORD
SET POINTER FOR LAST WORD OF 1ST LOG RECORD
END OF BUFFER
Y
N
SET POINTER TO NEXT LOGICAL RECORD
CHANGE FOR LAST WORD OF FIRST LOG RECORD
MT.LAC
GET NEXT WORD
EXIT
RDPT
STORE NEW POINTERS INTO BUFFER
EXIT


HEADER
SET NEW DELTA X AND Y, CHARSIZE AND INTENSITY
SETPLS
UNBLANKS PRECISIØN LIGHT SØURCE
NMGET1
PROCESS 2 CHARS.
EBGET
CØNVERT TØ BINARY
NMGET
PRØCESS 3 CHARS.
EBGET
CONVERT TØ BINARY
EBGET
Y
BVT3WD
GET NEXT BYTE
MULT. LAST DIGIT BY 10; ADD TØ LAST DIGIT; STØRE
ALL DIGITS PRØCESSED
N
Y
Y


NEXPAG
PPAGE
FLASH FØRM
FRLAS
FLASH ØVERALL FØRM
NEXPIC
ADVANCE PAGE AND FRAME
TØPPAGE
SET PARAMETERS FØR TØP PAGE
SET FØRM TØ NØT FLASH
TØPPAG
SET UP X-Y COORDS. FØR NEW PAGE AND FØRMS
YYYYYY
RESET Y DAC
XXXXXX
RESET X DAC


PPAGE
IS ERFLAG=0
N
Z
Y
IS ERFMFL=0
Z
FLASH
FHASH FØRM
SETØMU
SET FILM PARAMETERS
Z
SKIP FLASH?
Y
N
PFLASH
FLASH FORM
PFLASH
FRMTAB=0?
Y
AA
N
FLASH
FLASH FIRST FORM
ANY OTHER FORM TO FLASH?
N
AA
Y
LEGAL FORM REQUESTED
N
BB
Y
FLASH
FLASH FORM
AA


BB
MØNINT
ØUTPUT MSG 'NØ FØRM'
FRFLAS
ØVERALL FØRM TO BE FLASHED
N
Y
RØTATE
UPRIGHT FØRM IMAGE RØTATIØN
SET X-Y DAC PARAMETERS FØR ØVERALL FØRM
CC
CC
FLASH
FLASH ØVERALL FØRM
RESET PARAMETERS
RØTATE
RESTØRE PREVIØUS RØTATIØN
HEADER
SETS ALL PAGE PARAMETERS

2.13 COMA LACIE STATUS MODULE (PFC, COMA)

2.13.1 Background

A. Author. J. E. Bennett, Jr., Aeronutronic Ford Corp.

B. Intent. Stores status information on the disk when requested to do so by the calling program. Also at the request of the calling program, this information can be dumped to tape.

C. Program History

1. Production Tape Date. 7 April 1975

2. Author. J. E. Bennett, Jr.

3. Authorization. TIRF No. 2791

4. Test Case. TPS (JSC Form 1225) No. A16

5. Revisions. Reference Appendix B, paragraph B.13.

2.13.2 Introduction

2.13.2.1 Hardware Requirements

- FR80 with disk
- 9-track tape drive.

2.13.2.2 Software Requirements. III109 and III166

2.13.2.3 Assembly Parameters. None.

2.13.2.4 Operator Commands

A. DUMP STATUS TAPE. Causes status tape to be written.

B. WIPE OUT STATUS BLOCKS. Clears status area on disk.

2.13.3 Analysis

2.13.3.1 Major Control Section

A. Description. The LACIE status routines stack 33-word (66-byte) sample segment entries into a disk area of 250 blocks. This disk area is reserved for this function and protected from the system. The 250-block area can hold 1750 sample segment entries. All necessary address pointers are kept on the disk and are independent of program loading and/or reloading. The core address of the newest sample segment entry is provided by the calling program. When called, the status routines look up the necessary addresses on the disk, stores the new entry, and exits. Control is returned to the calling program if no disk error occurs. Upon an error, control is returned to MONITOR with an error message. When requested by the calling program, the entire contents of the status area is dumped from disk to tape. Each sample segment entry is one physical record on tape.

B. Input/Output

1. Input. Data is provided by calling program and in core memory.

2. Output. Data is to 9-track tape in 66-byte records.

C. Linkages

1. External

Routine	Program	Sequence
MONINT	III166	JMS MONINT
MONOUT	III166	JMP MONOUT

2. Internal

Routine	Calling Sequence
STATUS	JMS STATUS
DREAD	JMS DREAD
DWRITE	JMS DWRITE
FINDIR	JMS FINDIR
DRDBLK	JMS DRDBLK
INSERT	JMS INSERT
DCLEAR	JMP DCLEAR
DDMT	JMP DDMT
DMTGO	JMS DMTGO
DCKRDY	JMS DCKRDY
DREWI	JMS DREWI
DMTWRT	JMS DMTWRT
DBKSP	JMS DBKSP
DRDEOF	JMS DRDEOF

2.13.3.2 Subroutines

A. DBKSP. Backspaces magnetic tape one record.

B. DCKRDY. Checks to see if tape unit is ready. Does not exit until tape unit is ready.

C. DCLEAR. Clears all status information on disk.

D. DDMT. Dumps all status information from disk to tape. Each sample segment entry is one record on tape. The data is ended with a double EOF.

E. DMTGO. Loads tape command found in DTCMD and starts tape controller.

F. DMTWRT. Writes one record on tape. Calls DMTGO.

G. DRDBLK. Loads disk command found in DCMWRD and starts disk controller.

H. DRDEOF. Checks the double EOF to make sure that it was correctly written.

I. DREAD. Sets up to read from disk and calls DRDBLK.

J. DREWI. Rewinds the magnetic tape drive.

K. DWRITE. Sets up to write on the disk and calls DRDBLK.

L. FINDIR. Finds the status area on the disk from the information in the master and user directories on the disk.

M. INSERT. Places a sample segment entry into the proper space in a disk block. There are seven entries per block.

N. STATUS. Reads the current block from the disk, calls INSERT to add the new data, and writes the block back on the disk.

2.13.3.3 Constants and Variables

A. Internal

1. DBFAD. Contains address of data to be saved on disk.

2. DCMWRD. Contains current disk command (WRITE or READ).

3. DEOF. Contains negative zero if writing or reading an EOF; otherwise it is zero.

4. DIADRS. Address of first status block on disk is placed here by FINDIR.

5. DLASB. Contains current disk block address.

6. DLASBF. Contains current buffer position.

7. DPASS. Contains 1 if this is the first pass (WRITE TAPE); contains 2 if this is the second pass (READ/COMPARE).

8. DTAP. Contains unit number of tape drive.

9. DTCMD. Contains current tape command for DMTGO.

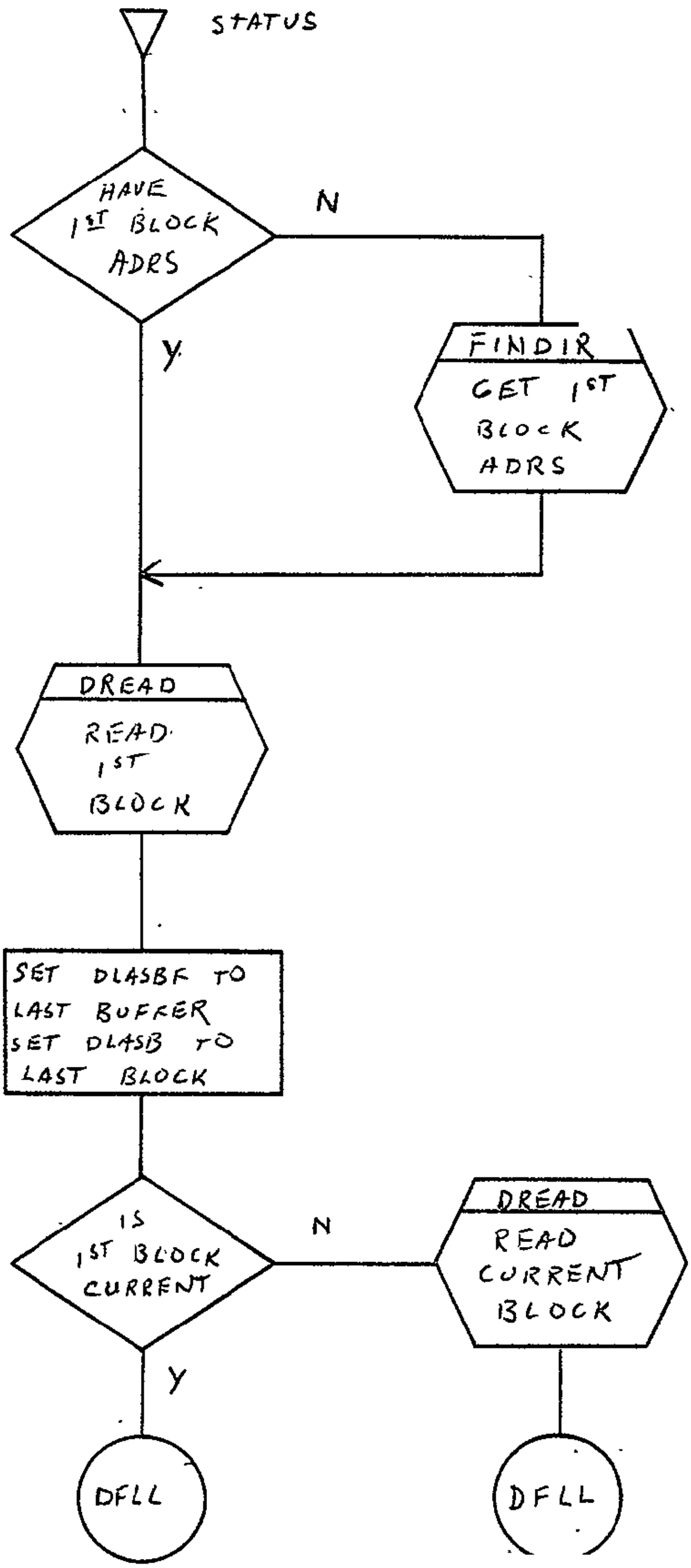
10. DWCD. Contains WRITE command for first pass and READ/COMPARE for second pass.

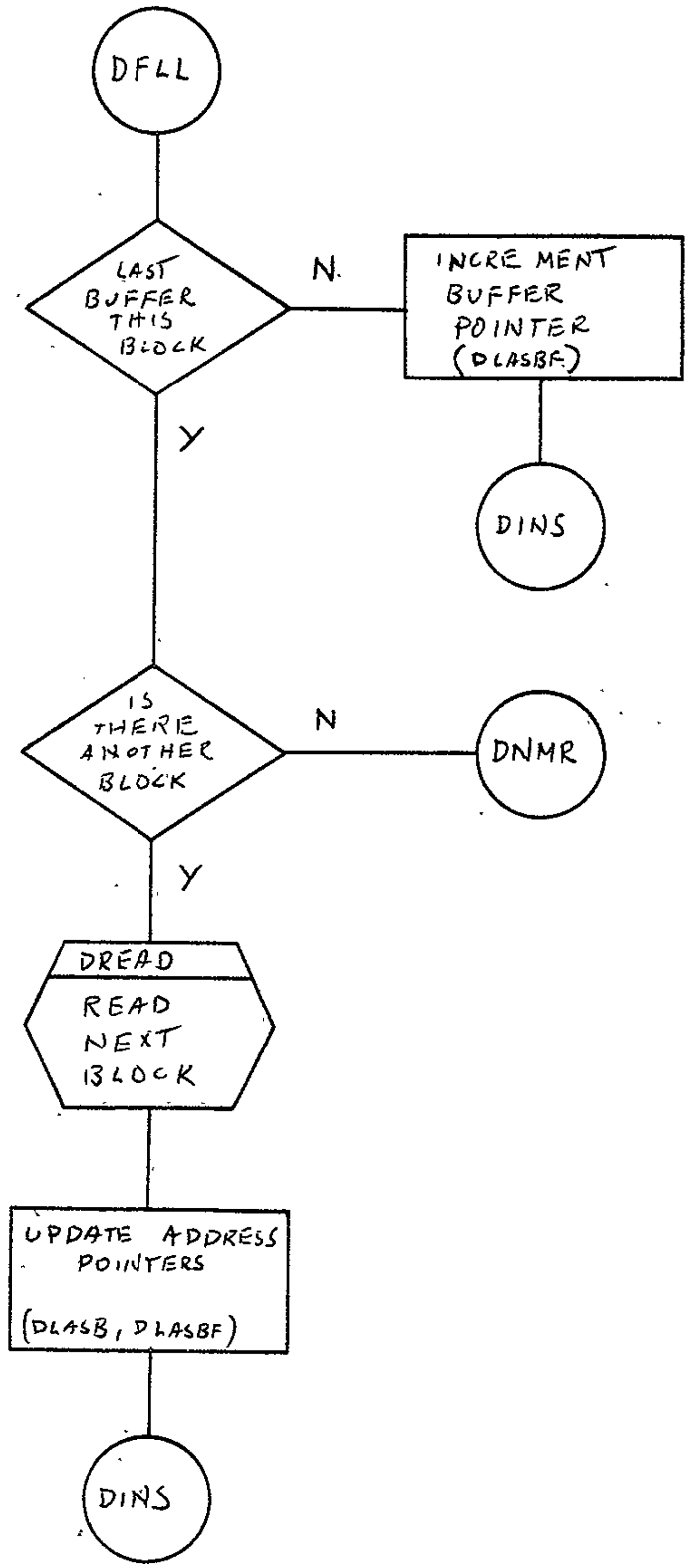
11. RPTIN. Contains number of retries to be allowed for tape errors.

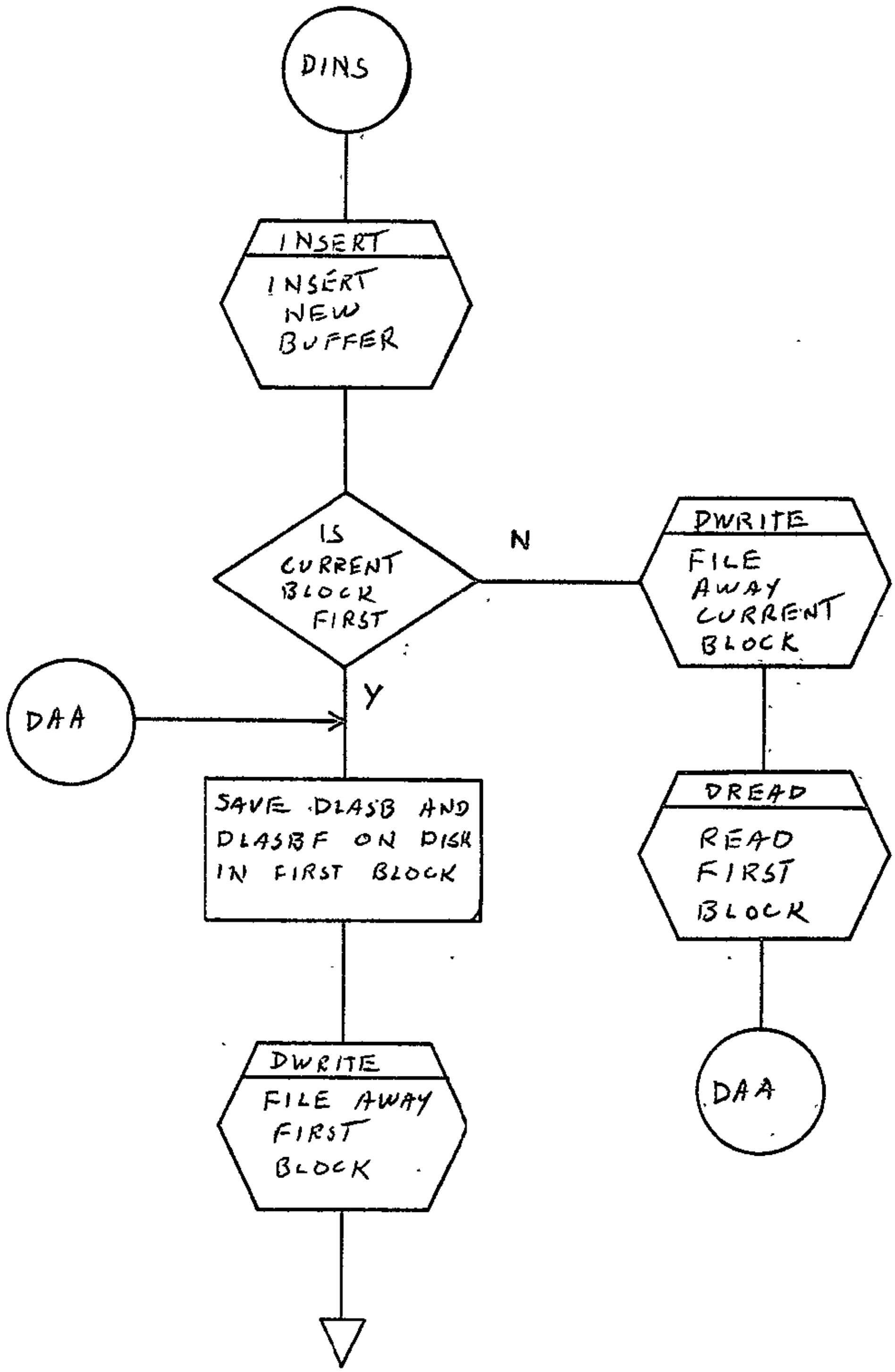
12. RPTOUT. Contains the number of skips to be allowed on write errors.

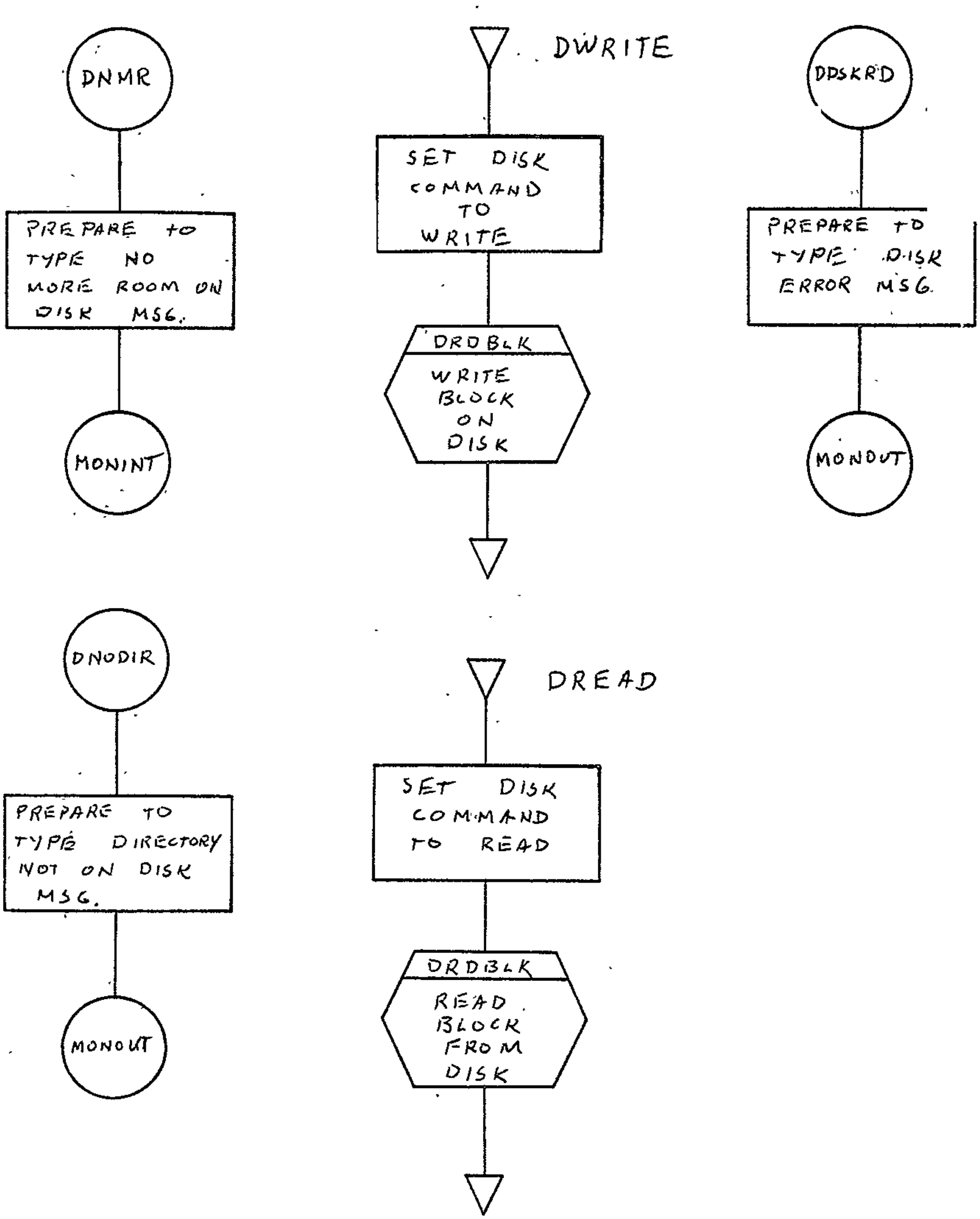
B. External. DATCOM contains the tape unit number.

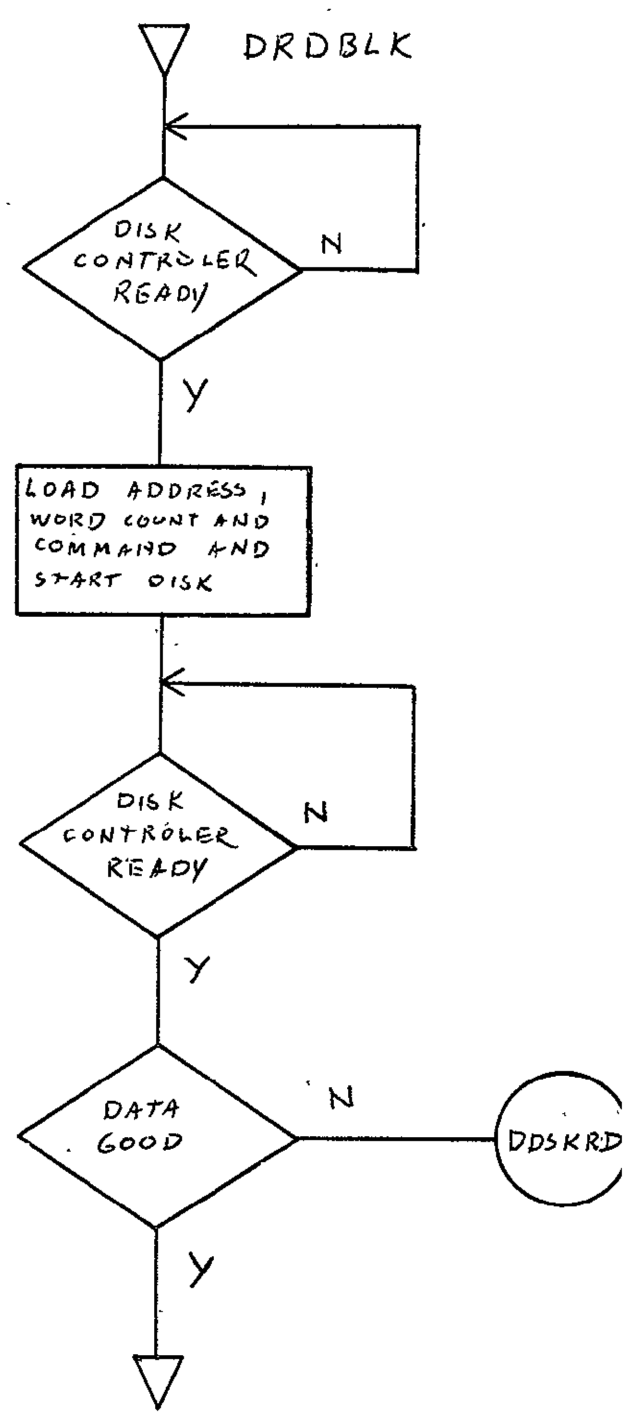
2.13.3.4 Flow Charts. See following pages.

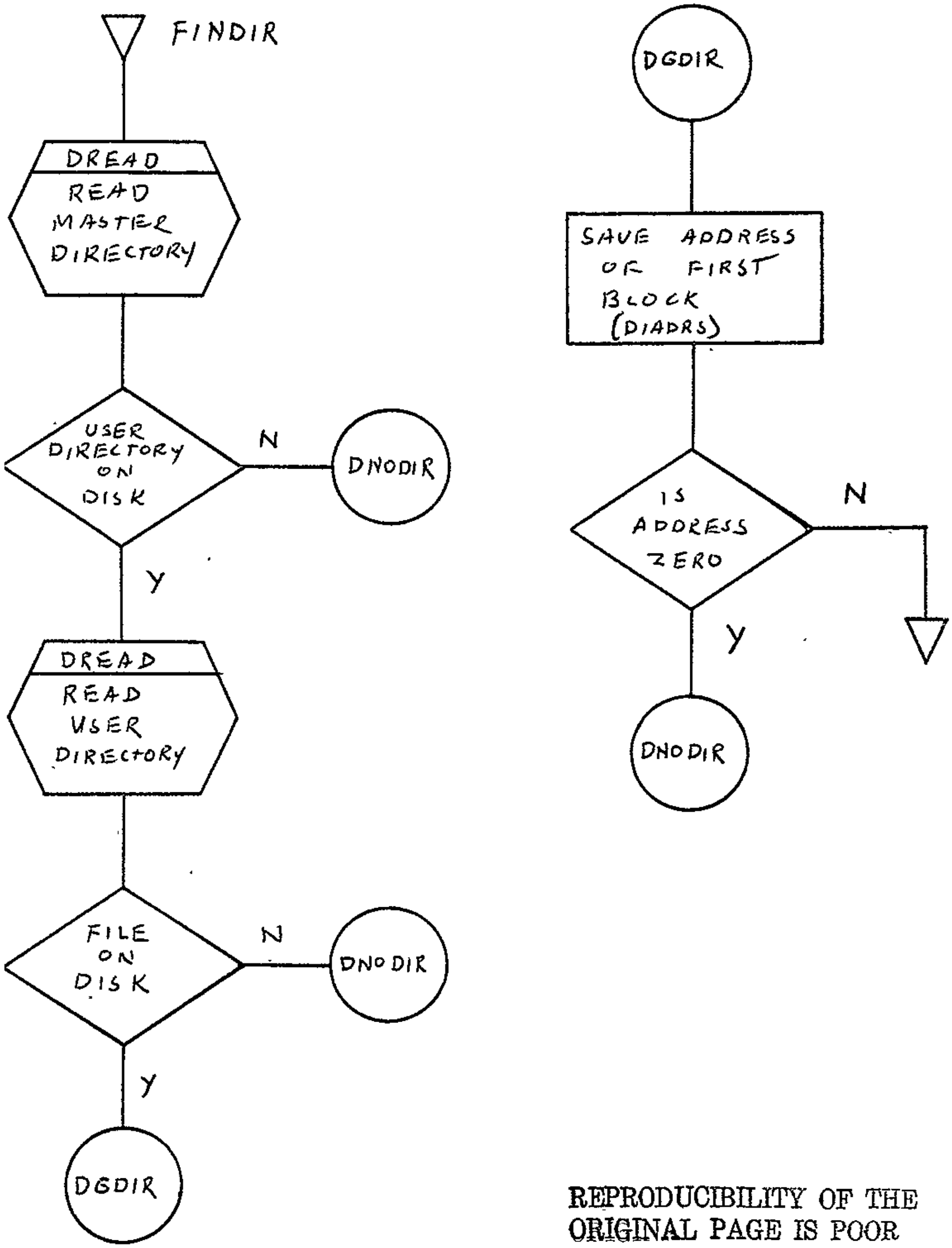

STATUS
HAVE 1ST BLOCK ADRS
N
Y
FINDIR
GET 1ST BLOCK ADRS
DREAD
READ 1ST BLOCK
SET DLASBF TO LAST BUFFER
SET DLASB TO LAST BLOCK
IS 1ST BLOCK CURRENT
N
Y
DREAD
READ CURRENT BLOCK
DFLL
DFLL

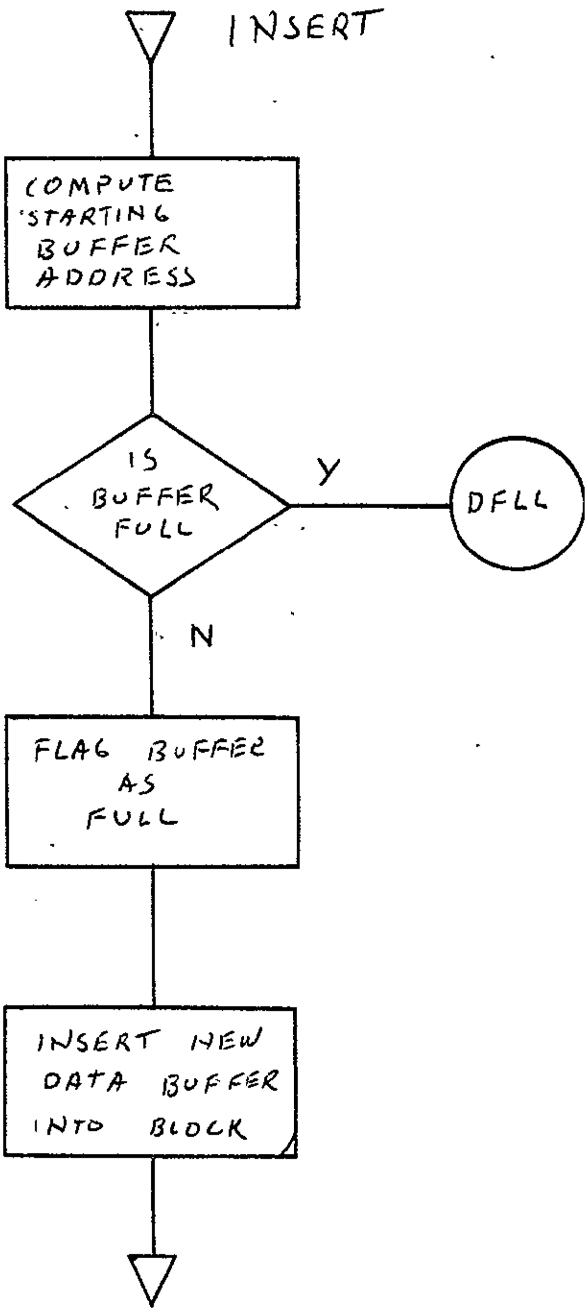

DFLL
LAST BUFFER THIS BLOCK
N.
INCREMENT BUFFER POINTER (DLASBF)
Y
DINS
IS THERE ANOTHER BLOCK
N
DNMR
Y
DREAD
READ NEXT BLOCK
UPDATE ADDRESS POINTERS
(DLASB, DLASBF)
DINS

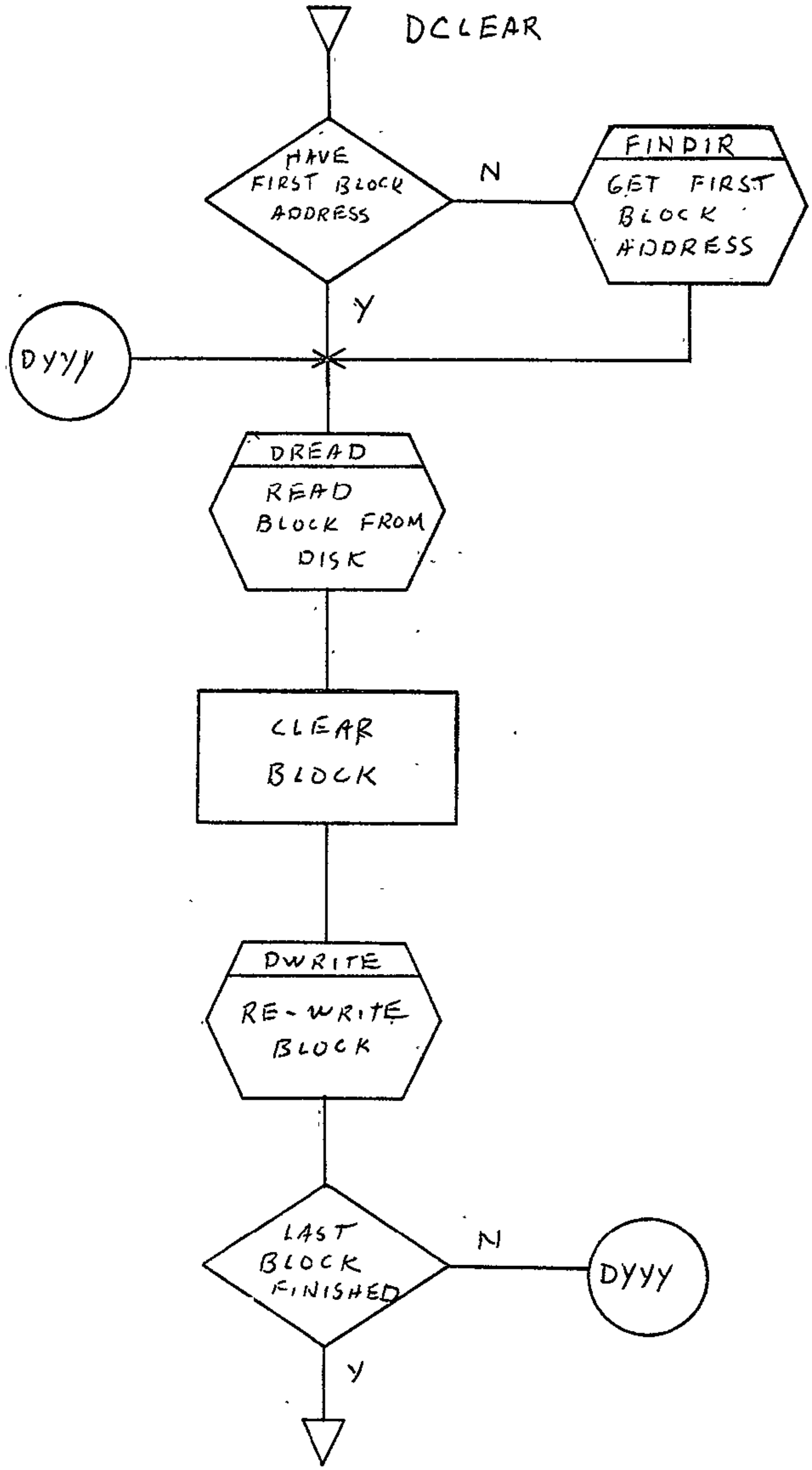

DINS
INSERT
INSERT NEW BUFFER
IS CURRENT BLOCK FIRST
N
DWRITE
FILE AWAY CURRENT BLOCK
Y
DAA
SAVE DLASB AND DLASBF ON DISK IN FIRST BLOCK
DREAD
READ FIRST BLOCK
DAA
DWRITE
FILE AWAY FIRST BLOCK

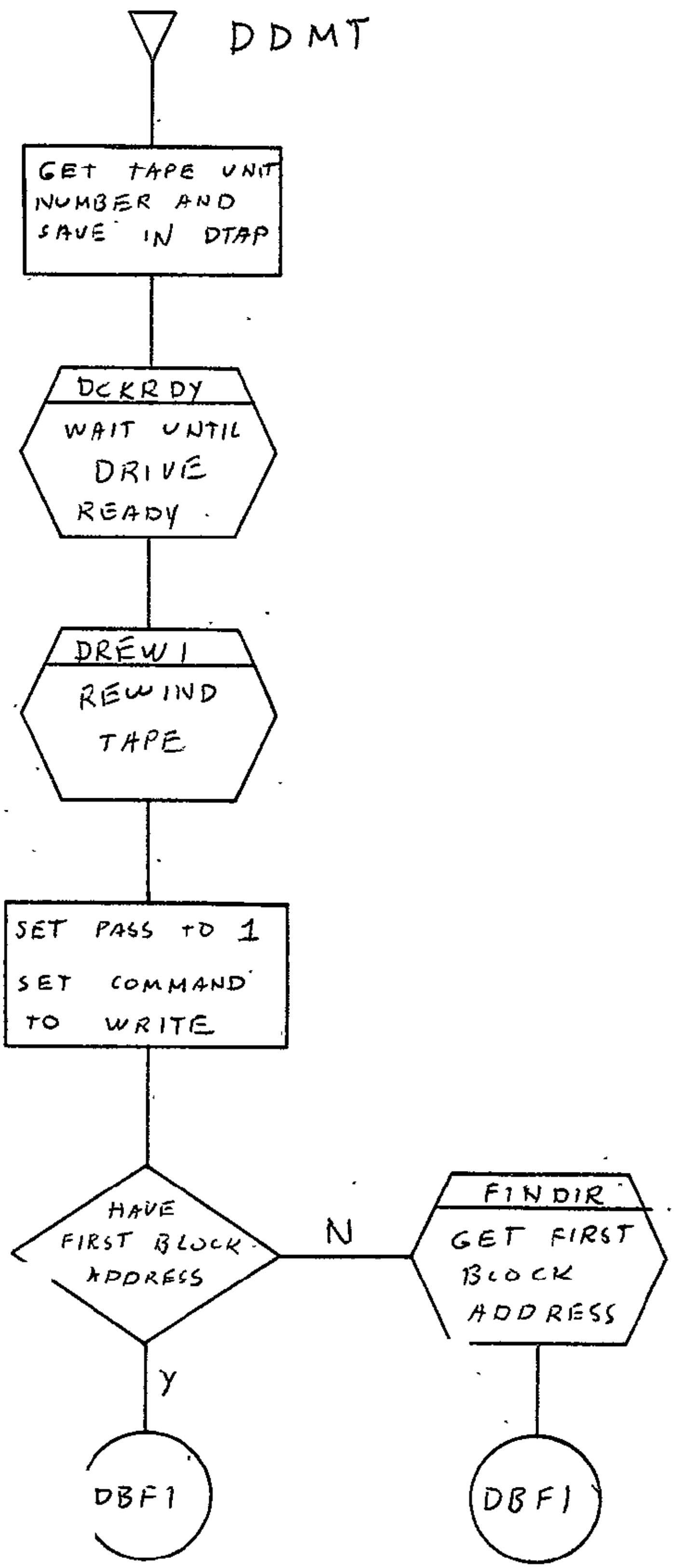

DNMR
PREPARE TO TYPE NO MORE ROOM ON DISK MSG.
MONINT
DWRITE
SET DISK COMMAND TO WRITE
DRDBLK
WRITE BLOCK ON DISK
DPSKRD
PREPARE TO TYPE DISK ERROR MSG.
MONOUT
DNODIR
PREPARE TO TYPE DIRECTORY NOT ON DISK MSG.
MONOUT
DREAD
SET DISK COMMAND TO READ
DRDBLK
READ BLOCK FROM DISK

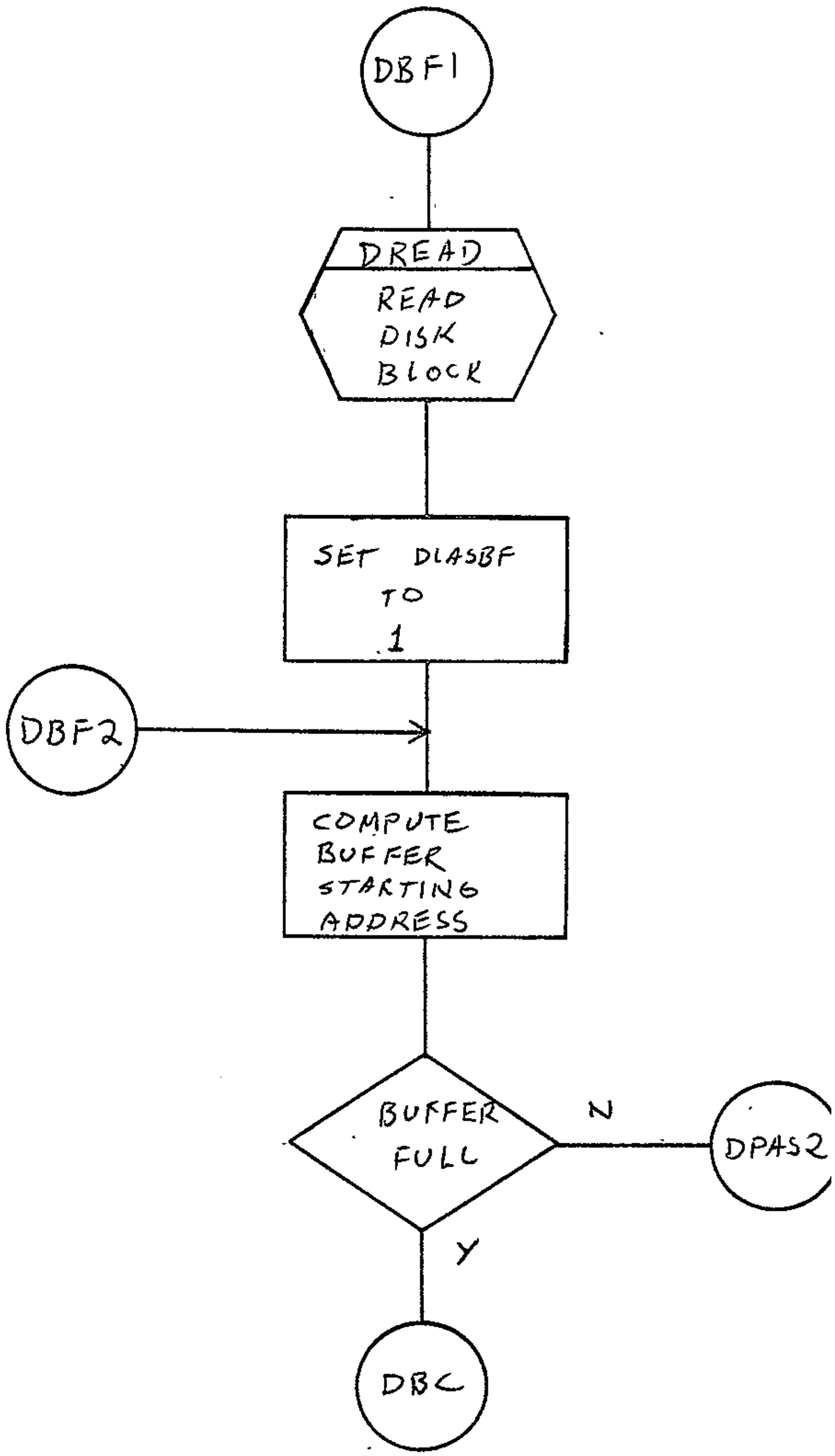

DRDBLK
DISK CONTROLER READY
N
Y
LOAD ADDRESS, WORD COUNT AND COMMAND AND START DISK
DISK CONTROLER READY
N
Y
DATA GOOD
N
DDSKRD
Y

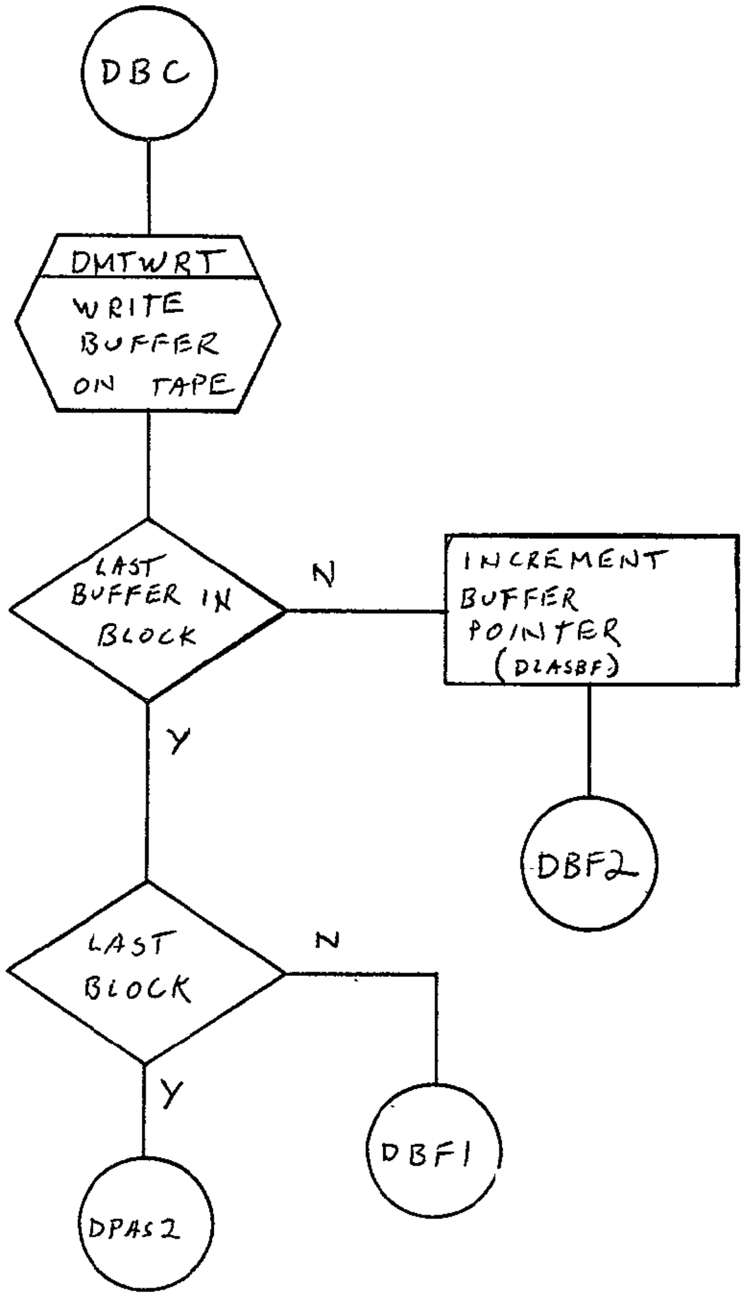

FINDIR
DREAD
READ MASTER DIRECTORY
USER DIRECTORY ON DISK
N
DNODIR
Y
DREAD
READ USER DIRECTORY
FILE ON DISK
N
DNODIR
Y
DGDIR
DGDIR
SAVE ADDRESS OF FIRST BLOCK (DIADRS)
IS ADDRESS ZERO
N
Y
DNODIR

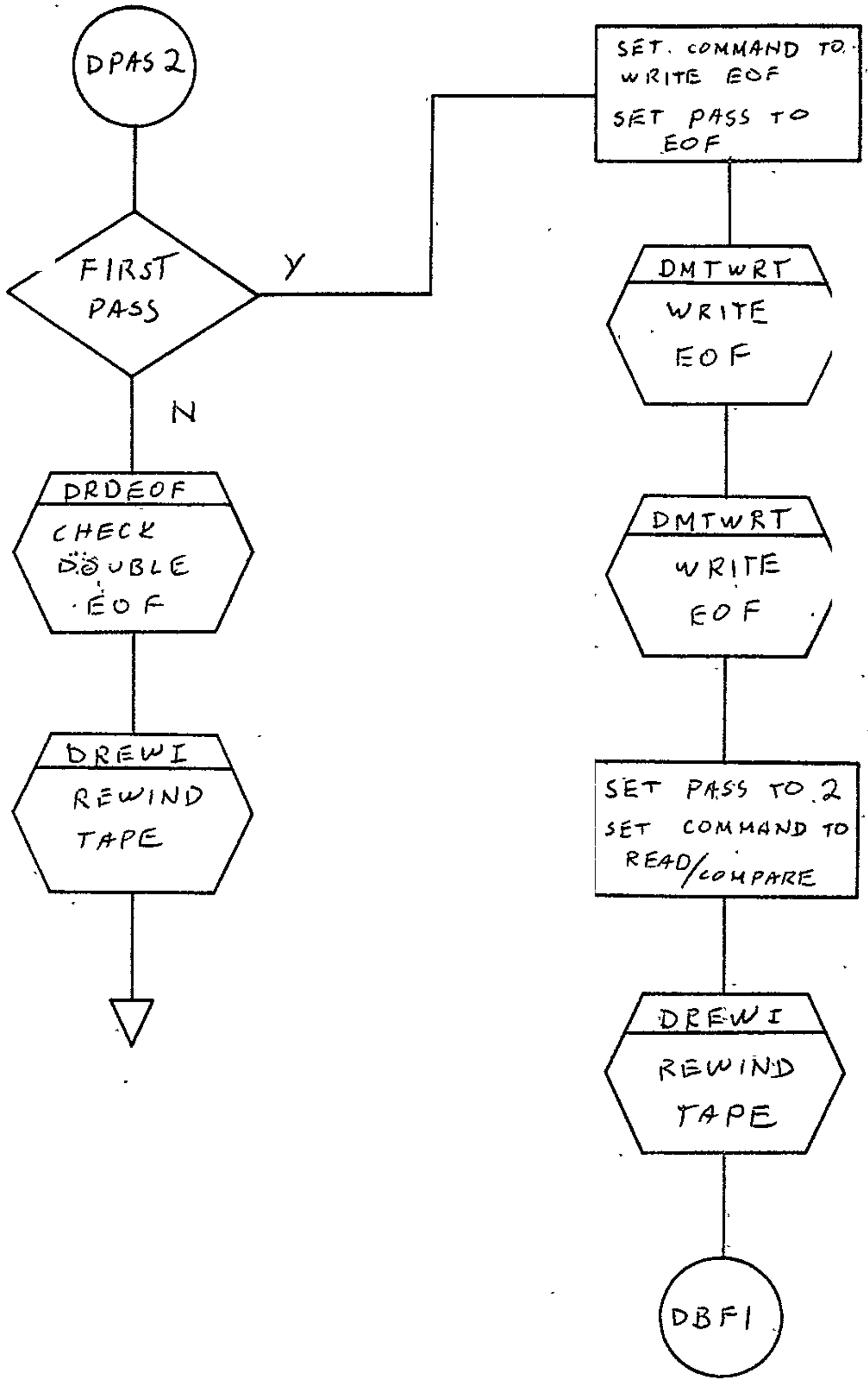

INSERT
COMPUTE STARTING BUFFER ADDRESS
IS BUFFER FULL
Y
DFLL
N
FLAG BUFFER AS FULL
INSERT NEW DATA BUFFER INTO BLOCK

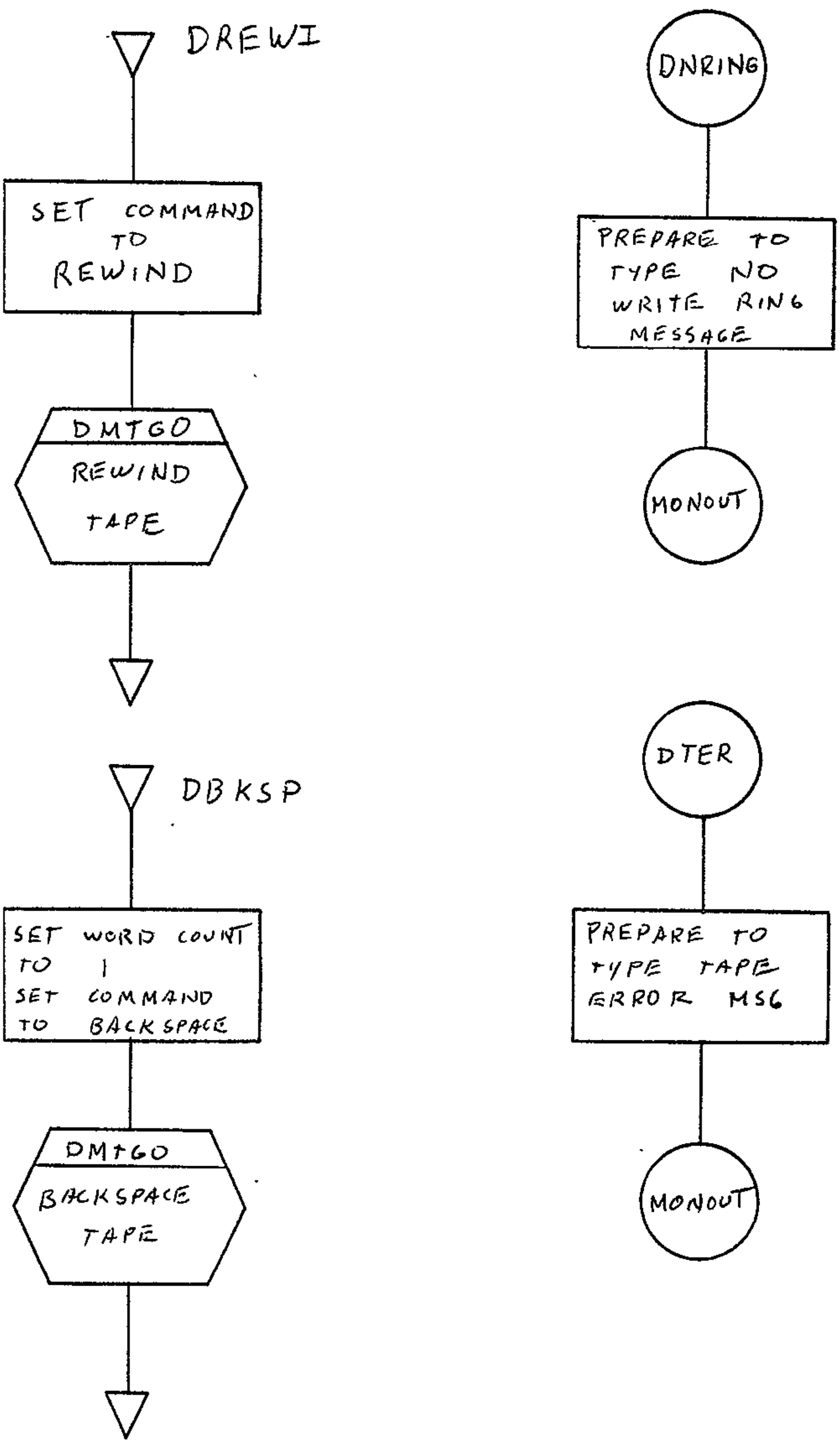

DCLEAR
HAVE FIRST BLOCK ADDRESS
N
FINDIR
GET FIRST BLOCK ADDRESS
Y
DYYY
DREAD
READ BLOCK FROM DISK
CLEAR BLOCK
DWRITE
RE-WRITE BLOCK
LAST BLOCK FINISHED
N
DYYY
Y

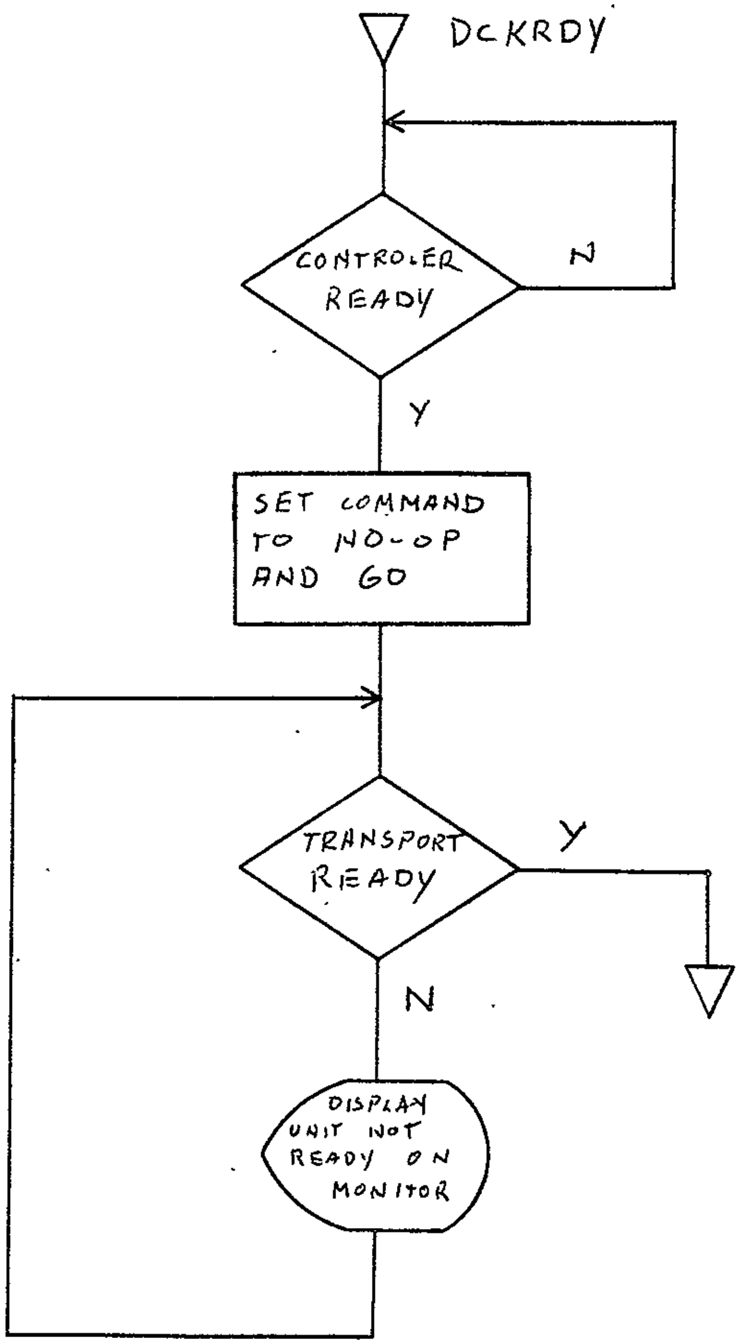

DDMT
GET TAPE UNIT NUMBER AND SAVE IN DTAP
DCKRDY
WAIT UNTIL DRIVE READY
DREW1
REWIND TAPE
SET PASS TO 1
SET COMMAND TO WRITE
HAVE FIRST BLOCK ADDRESS
N
FINDIR
GET FIRST BLOCK ADDRESS
Y
DBF1
DBF1

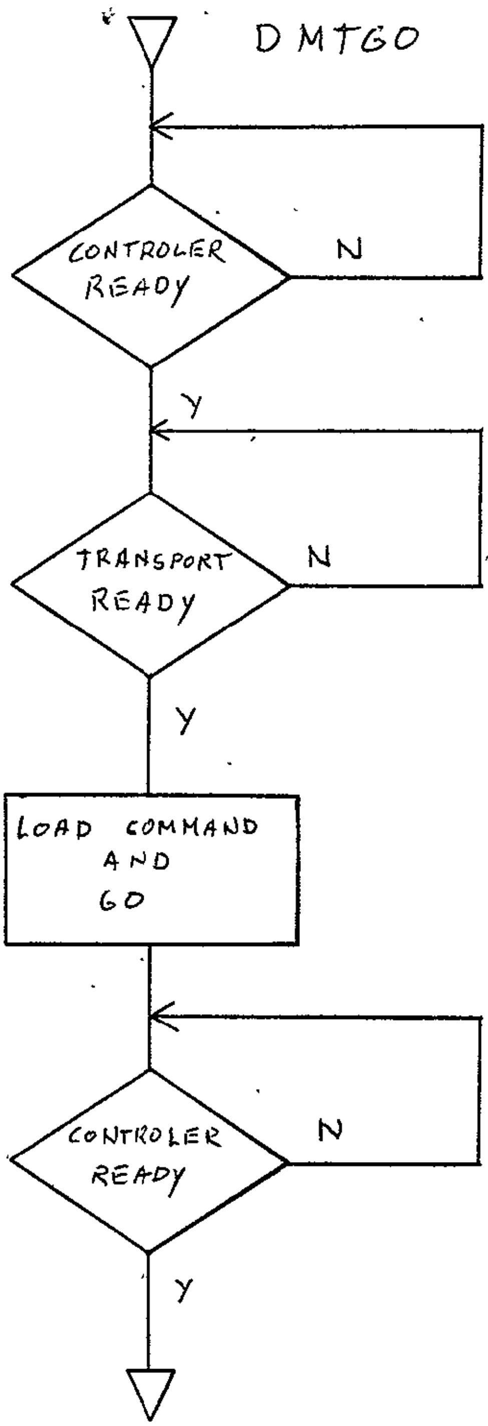

DBF1
DREAD
READ
DISK
BLOCK
SET DLASBF
TO
1
DBF2
COMPUTE
BUFFER
STARTING
ADDRESS
BUFFER
FULL
N
DPAS2
Y
DBC

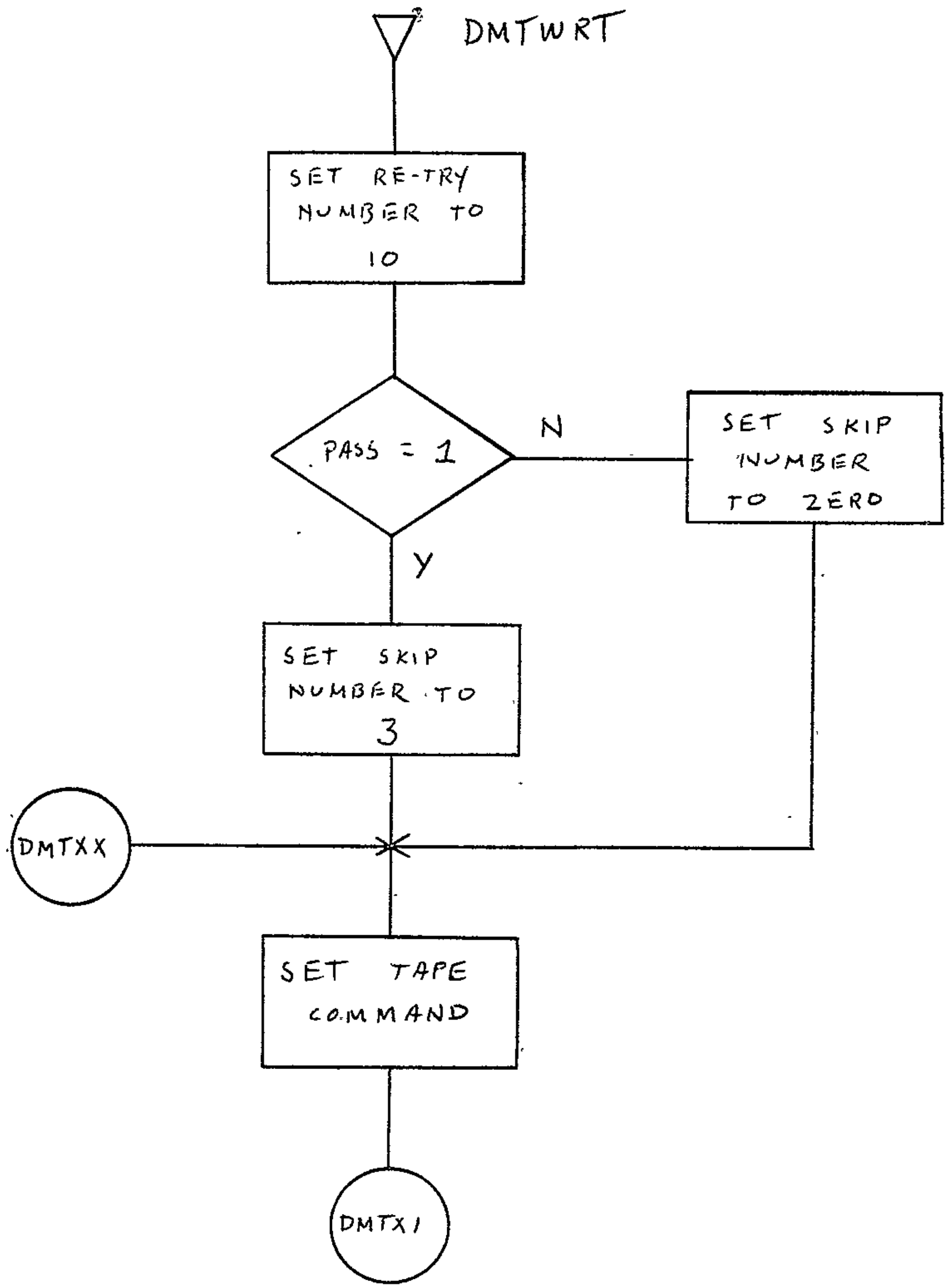

DBC
DMTWRT
WRITE BUFFER ON TAPE
LAST BUFFER IN BLOCK
N
Y
INCREMENT BUFFER POINTER (DLASBF)
DBF2
LAST BLOCK
N
Y
DBF1
DPAS2

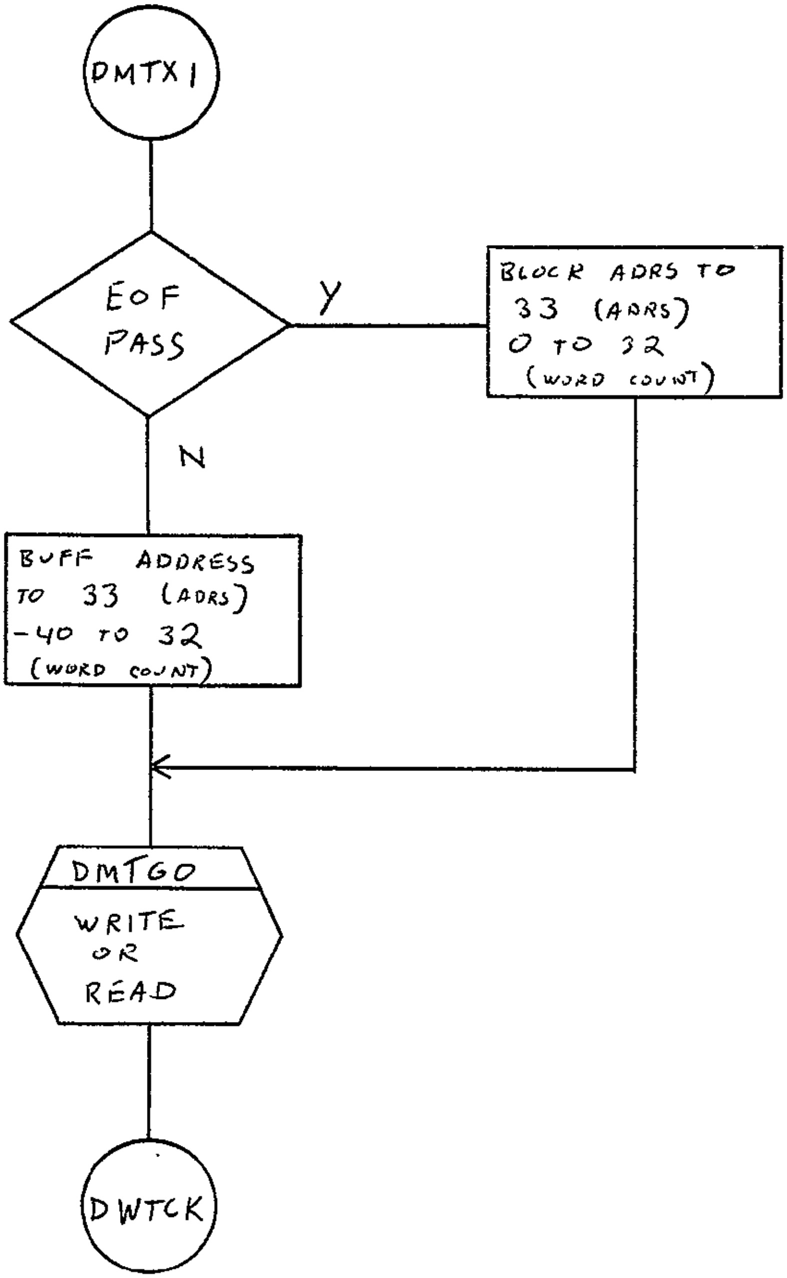

DPAS 2
FIRST PASS
Y
N
SET COMMAND TO WRITE EOF
SET PASS TO EOF
DMTWRT
WRITE EOF
DMTWRT
WRITE EOF
SET PASS TO 2
SET COMMAND TO READ/COMPARE
DREWI
REWIND TAPE
DRDEOF
CHECK DOUBLE EOF
DREWI
REWIND TAPE
DBFI

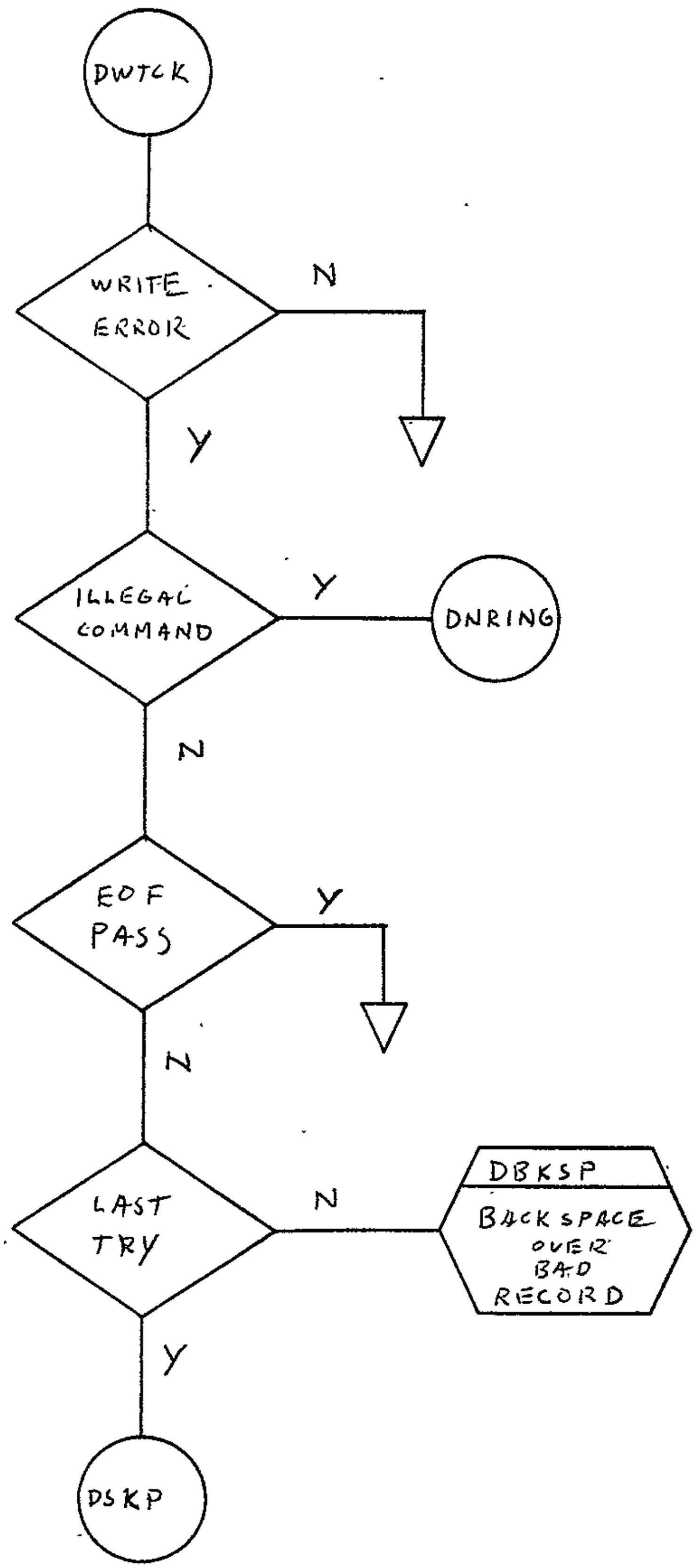

DREWI
SET COMMAND TO REWIND
DMTGO
REWIND TAPE
DBKSP
SET WORD COUNT TO 1
SET COMMAND TO BACKSPACE
DMTGO
BACKSPACE TAPE
DNRING
PREPARE TO TYPE NO WRITE RING MESSAGE
MONOUT
DTER
PREPARE TO TYPE TAPE ERROR MSG
MONOUT

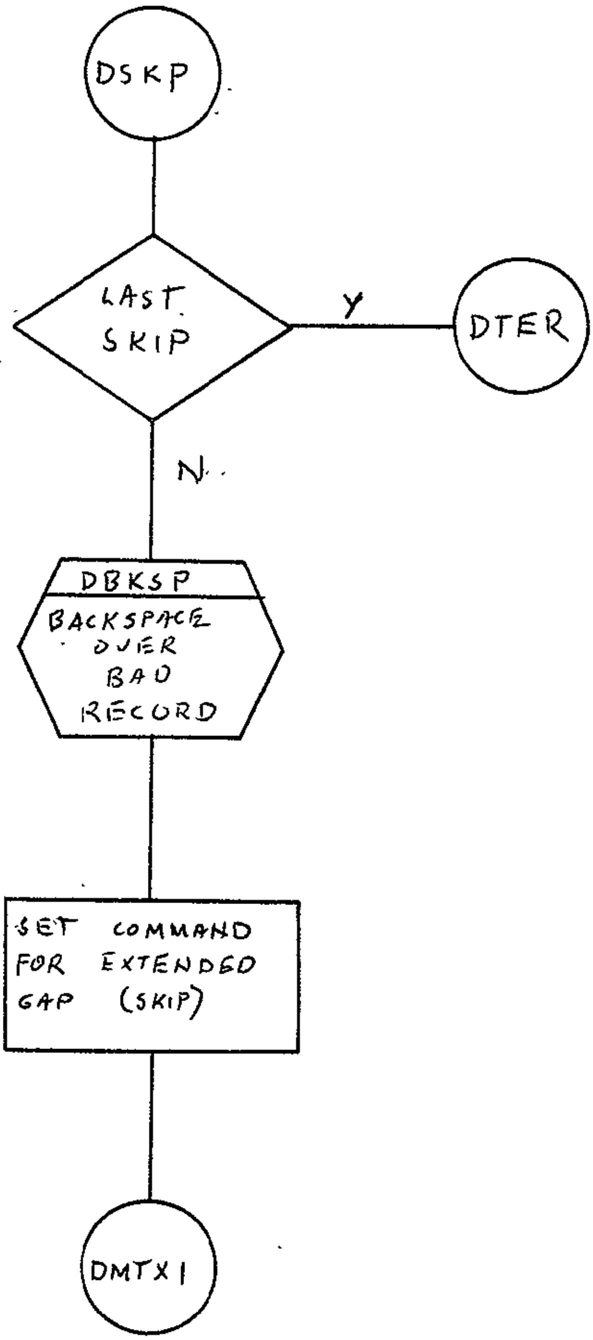

DCKRDY
CONTROLER READY
N
Y
SET COMMAND TO NO-OP AND GO
TRANSPORT READY
Y
N
DISPLAY UNIT NOT READY ON MONITOR

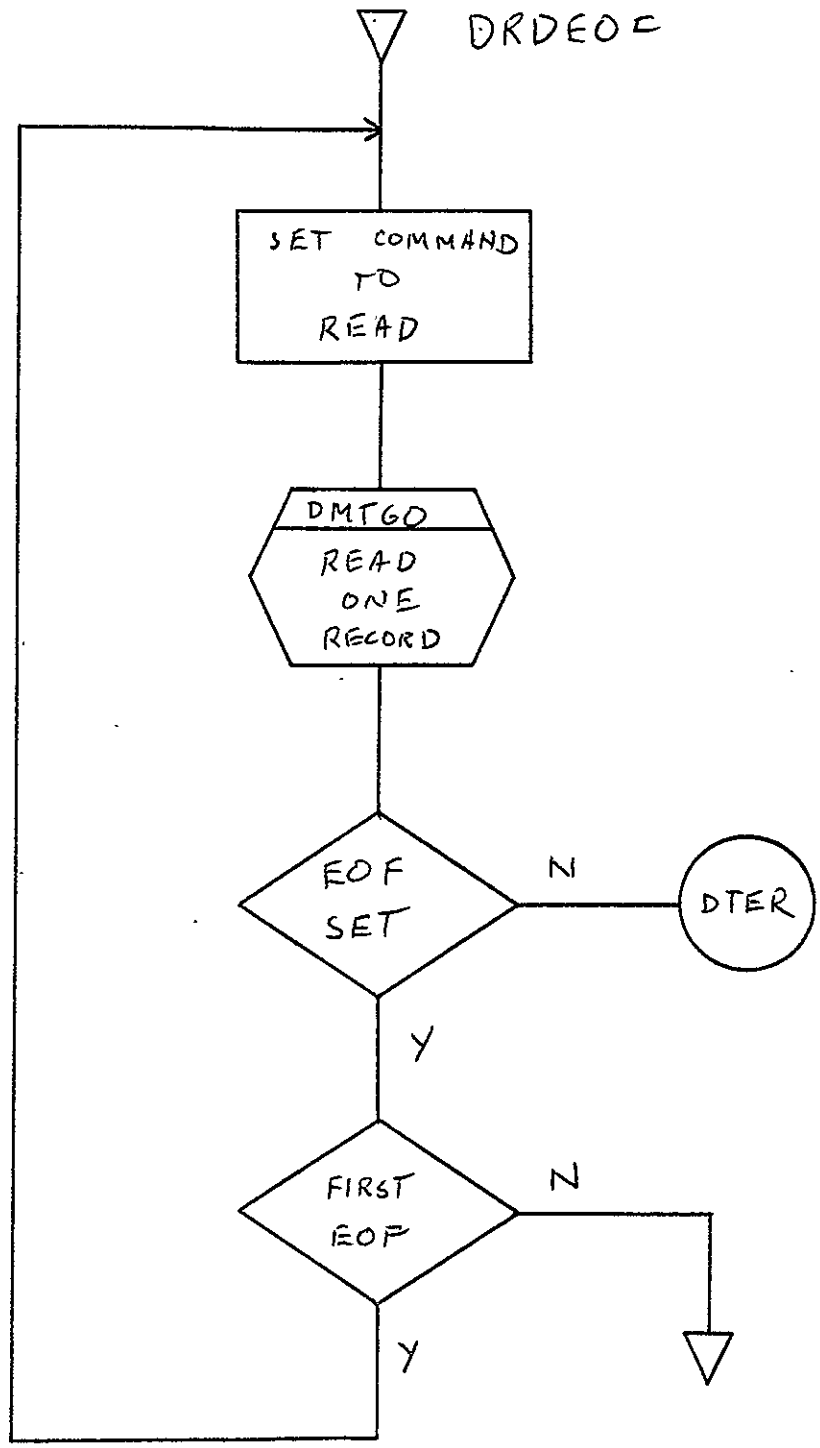

DMTGO
CONTROLER READY
N
Y
TRANSPORT READY
N
Y
LOAD COMMAND AND GO
CONTROLER READY
N
Y


DMTWRT
SET RE-TRY NUMBER TO 10
PASS = 1
N
SET SKIP NUMBER TO ZERO
Y
SET SKIP NUMBER TO 3
DMTXX
SET TAPE COMMAND
DMTX1


DMTX1
EOF PASS
Y
BLOCK ADRS TO 33 (ADRS) 0 TO 32 (WORD COUNT)
N
BUFF ADDRESS TO 33 (ADRS) -40 TO 32 (WORD COUNT)
DMTGO
WRITE OR READ
DWTCK


DWTCK
WRITE ERROR
N
Y
ILLEGAL COMMAND
Y
DNRING
N
EOF PASS
Y
N
LAST TRY
N
DBKSP
BACKSPACE OVER BAD RECORD
Y
DSKP


DSKP
LAST SKIP
Y
DTER
N
DBKSP
BACKSPACE OVER BAD RECORD
SET COMMAND FOR EXTENDED GAP (SKIP)
DMTX1


DRDEOC
SET COMMAND TO READ
DMTGO
READ ONE RECORD
EOF SET
N
DTER
Y
FIRST EOF
N
Y

2.14 COMA LACIE STATUS DISPLAY (REVEAL)

2.14.1 Background

A. Author. J. E. Bennett, Jr., Aeronutronic Ford Corp.

B. Intent. Displays on the monitor the status information currently written on the disk. This allows the operators to determine which jobs were run successfully, not run successfully, or not run at all.

C. Program History

1. Production Tape Date. 28 May 1975

2. Author. J. E. Bennett, Jr.

3. Authorization. JSC Form 994, TIRF No. 1700

4. Test Case. TPS (JSC Form 1225) No. A15

5. Revisions. Reference Appendix B, paragraph B.14

2.14.2 Introduction

2.14.2.1 Hardware Requirements

- FR80 with disk
- 9-track tape drive.

2.14.2.2 Software Requirements

III109	III166
III164	III164 FILM
DISK STATUS	

2.14.2.3 Assembly Parameters

A. BIGBUF. If 0, allows full monitor with dispatch table display.

B. 7-TRACK. If 0, prevents assembly of 7-track tape code.

C. 9-TRACK. If 0, prevents assembly of 9-track tape code.

D. CAMNUM. If 0, prevents assembly of camera supervision code.

E. NOFOCS. If 0, prevents insertion of focus pattern.

F. FONT. If 0, selects I.I.I. film font.

G. FASTTY. If 1, inserts program interrupt teletype controls.

H. EBCDIC. If 1, inserts EBCDIC character code.

2.14.2.4 Operator Commands

*REVEAL STATUS INFO

*WIPE OUT STATUS BLOCKS

*DUMP STATUS TAPE

2.14.3 Analysis

2.14.3.1 Major Control Section

A. Description. At location BEGIN, the first three blocks of the status area are read into core. The program then enters a loop which flashes the headers and then flashes the three data blocks, one line at a time. There are seven entries per block, so 21 entries are displayed on the monitor. The program remains in this loop until interrupted by the operator. The operator can have the program read the next block or back up one block (if not already at the beginning). The new block is inserted into position three, the other blocks move up, and the first block moves off the screen. The display rotates seven entries at a time.

B. Input/Output

1. Input. Input data is already on the disk.

2. Output. Output data is in the form of a visual display to the monitor or to 9-track tape.

C. Linkages

1. External

Routine	Program	Calling Sequence
FINDIR	DISK STATUS	JMS FINDIR
MDBUG	III166	JMS MDBUG
MONINT	III166	JMS MONINT
MERASE	III166	JMS MERASE

2. Internal

Routine	Calling Sequence
CHEC	JMS CHEC
HEADPT	JMS HEADPT
DISBLK	JMS DISBLK
GETBLK	JMS GETBLK
LINE	JMS LINE

2.14.3.2 Subroutines

A. CHEC. Checks for keyboard entry from operator and takes proper action if required.

B. DISBLK. Controls the display of one block of data and calls LINE to display each line.

C. GETBLK. Reads a block from disk.

D. HEADPT. Plots the header for the display.

E. LINE. Plots one sample segment entry as one line of data.

2.14.3.3 Constants and Variables

A. BASEPT. Identifies message pointers for production completion code messages.

B. BLKCNT. Contains the number of lines remaining to be displayed in a block.

C. BLOCK1. Pointer to the first block to be displayed.

D. BLOCK2. Pointer to the second block to be displayed.

E. BLOCK3. Pointer to the third block to be displayed.

F. BLOK. Pointer to the current block to be displayed.

G. DEADLN. A dummy line of zero entries used as filler.

H. DSCAD. Contains the disk address of a block to be rea

I. HEADER. The first location of the header data.

J. LINEPT. Contains the address of the current line.

K. MEMAD. Contains the core address of a disk block to be read.

L. NEXT. Points to the address of the next block on the disk which can be displayed.

M. POINTR. Table which contains the disk addresses of the data blocks on the disk.

N. TABEL. Locates the monitor dispatch table for the ASR MONITOR.

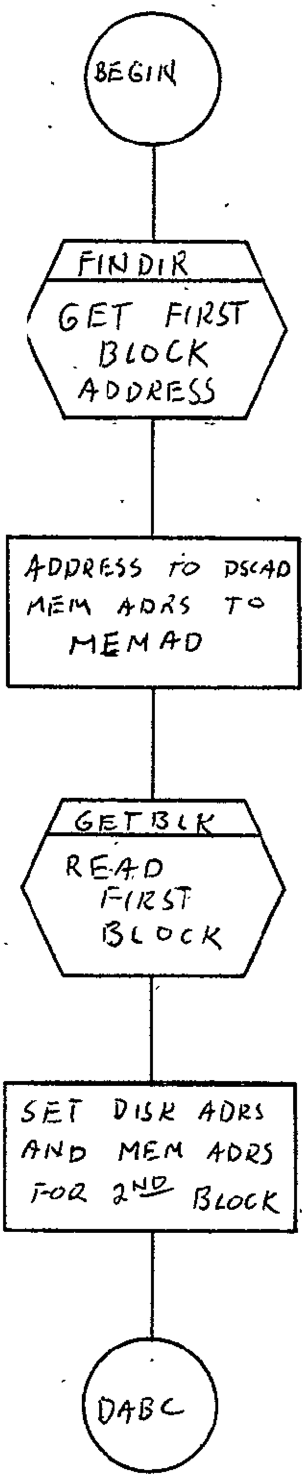
O. XDE. X delta for spacing.

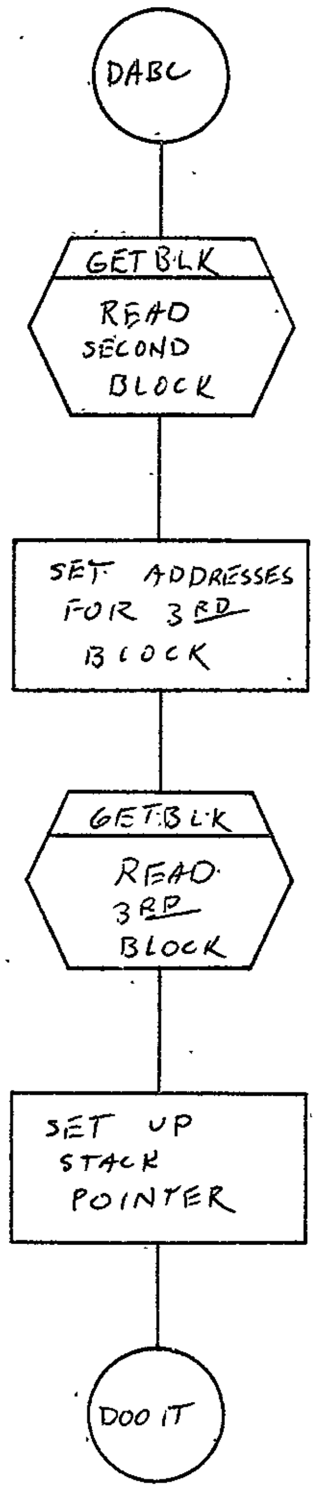
P. XST. X starting position on screen.

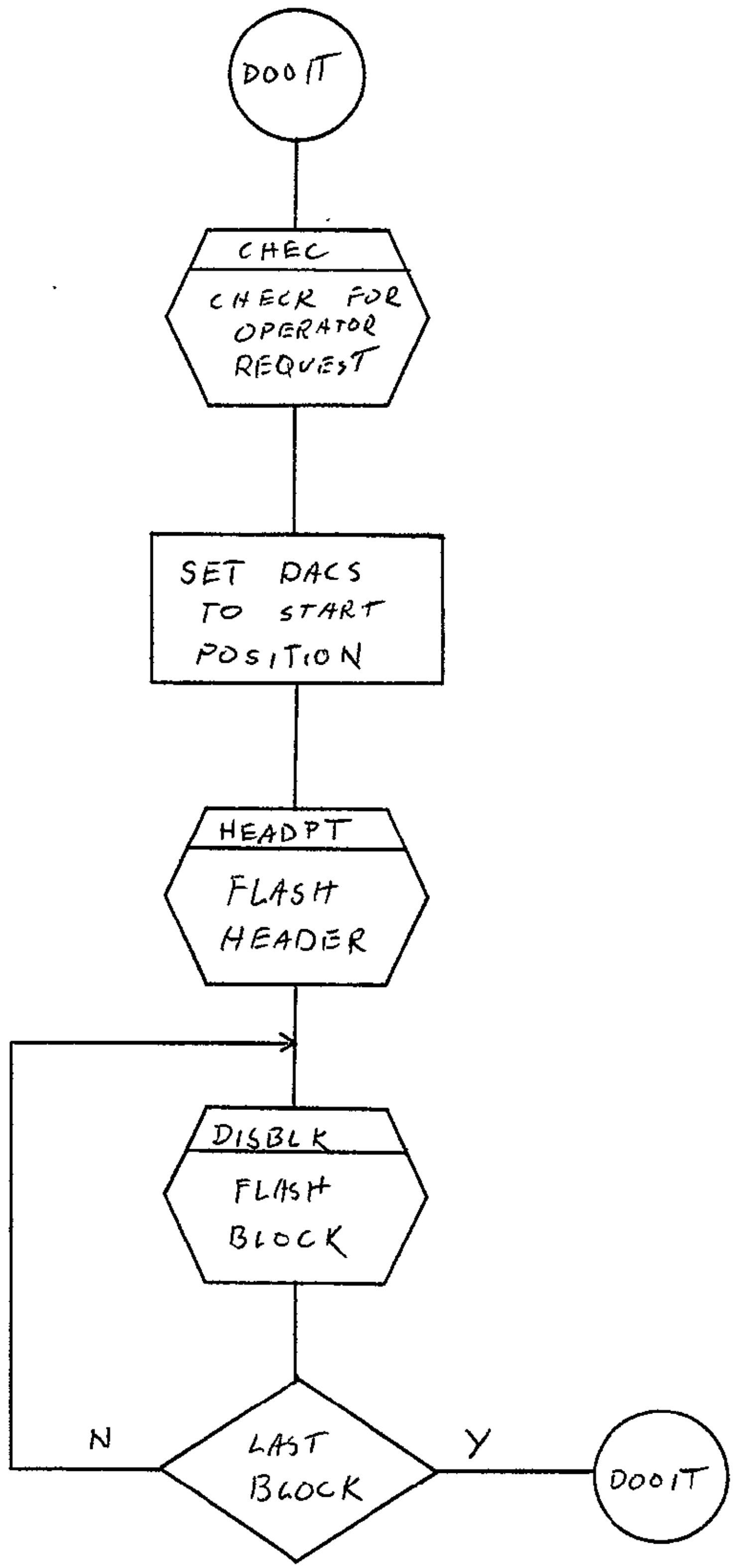
Q. YDE. Y delta for spacing.

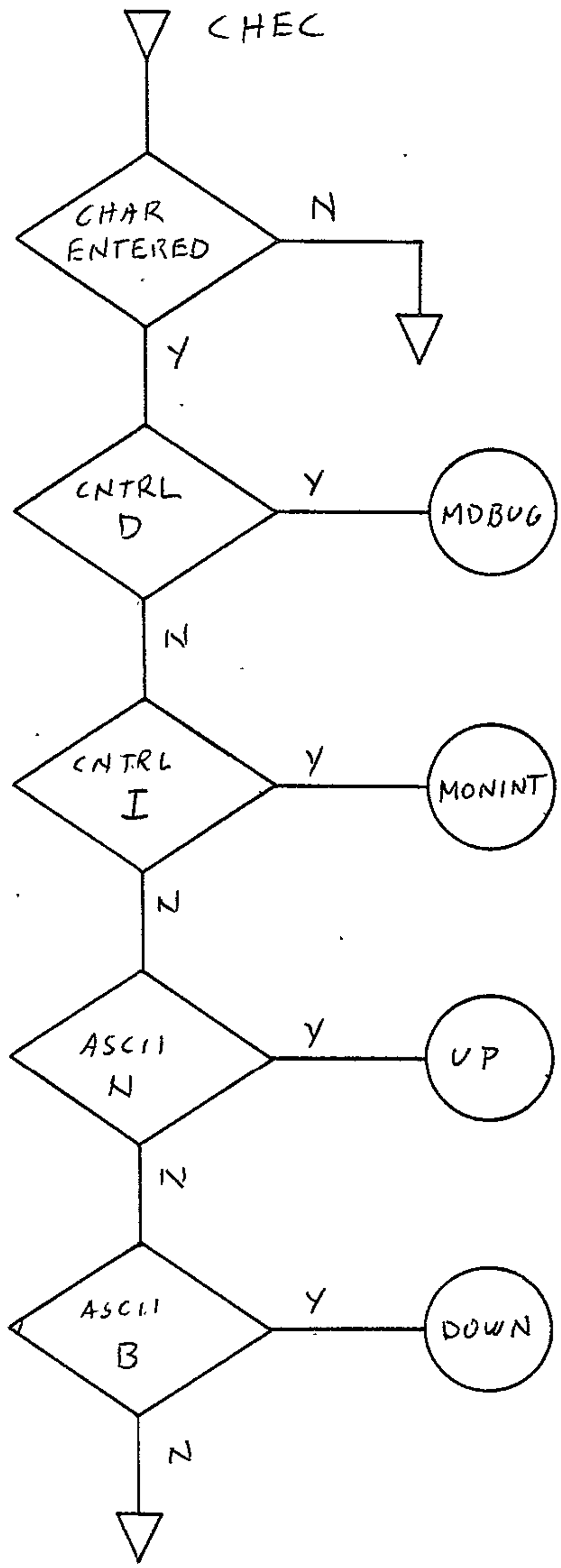
R. YST. Y starting position on screen.

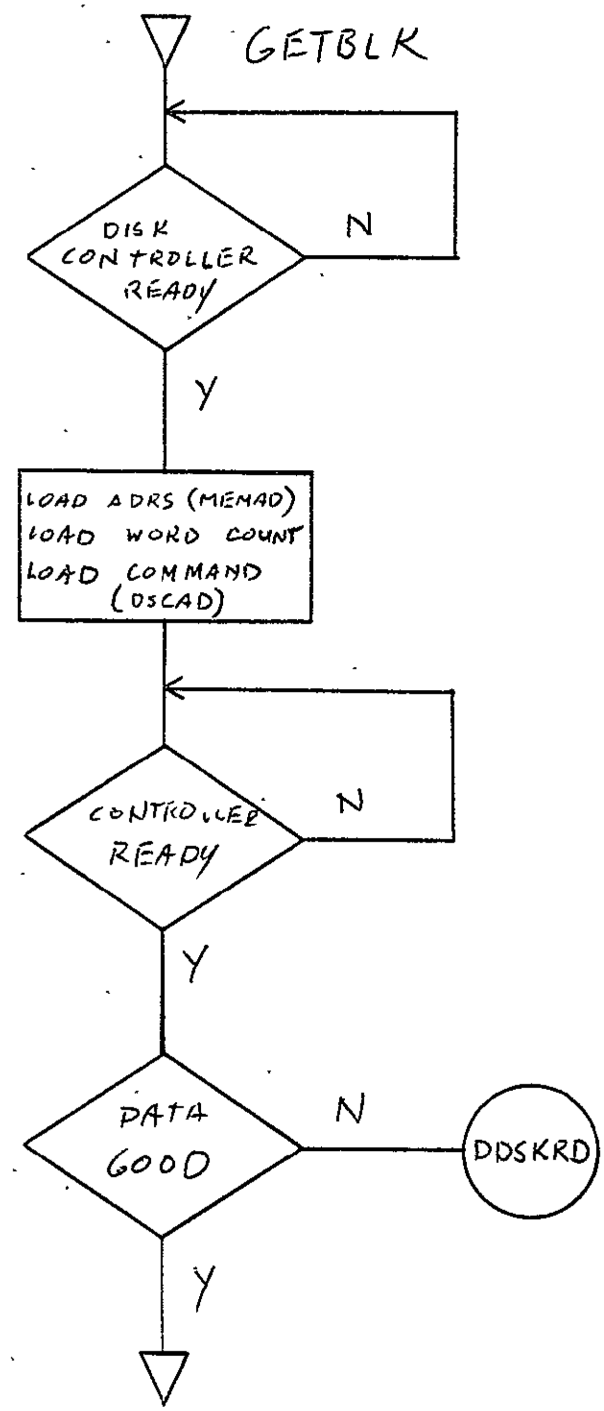
2.14.3.4 Flow Charts. See following pages.

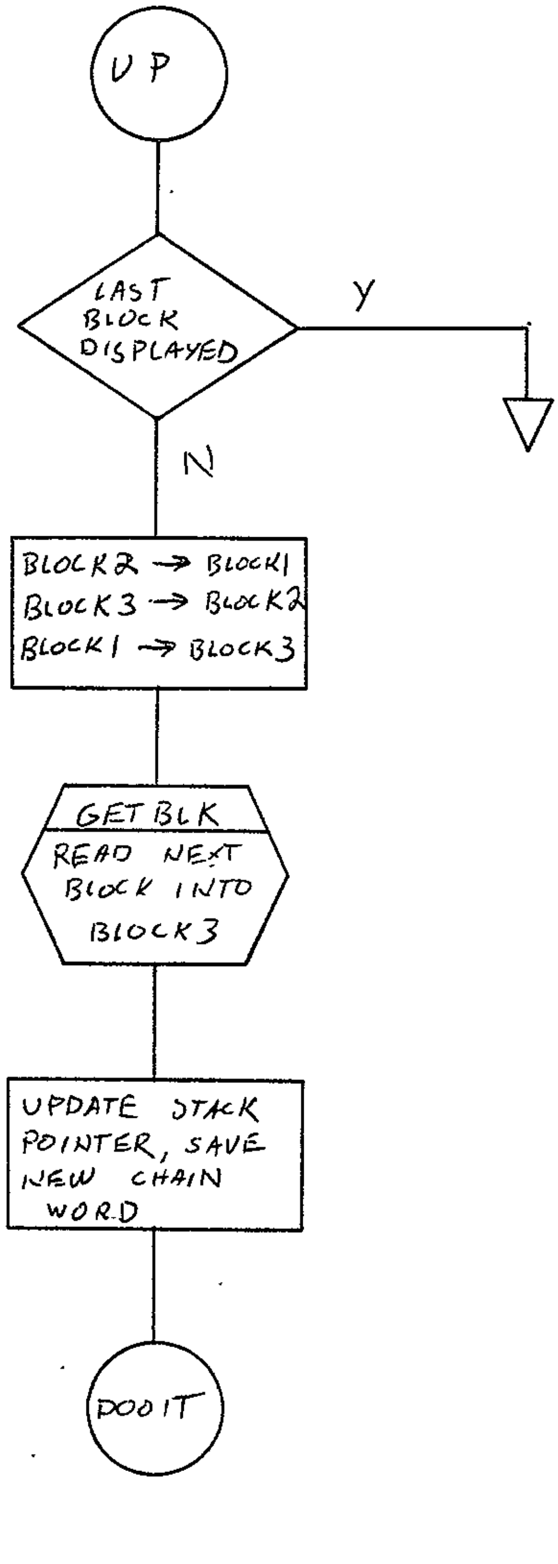

BEGIN
FINDIR
GET FIRST BLOCK ADDRESS
ADDRESS TO DSCAD
MEM ADRS TO MEMAD
GETBLK
READ FIRST BLOCK
SET DISK ADRS AND MEM ADRS FOR 2ND BLOCK
DABC

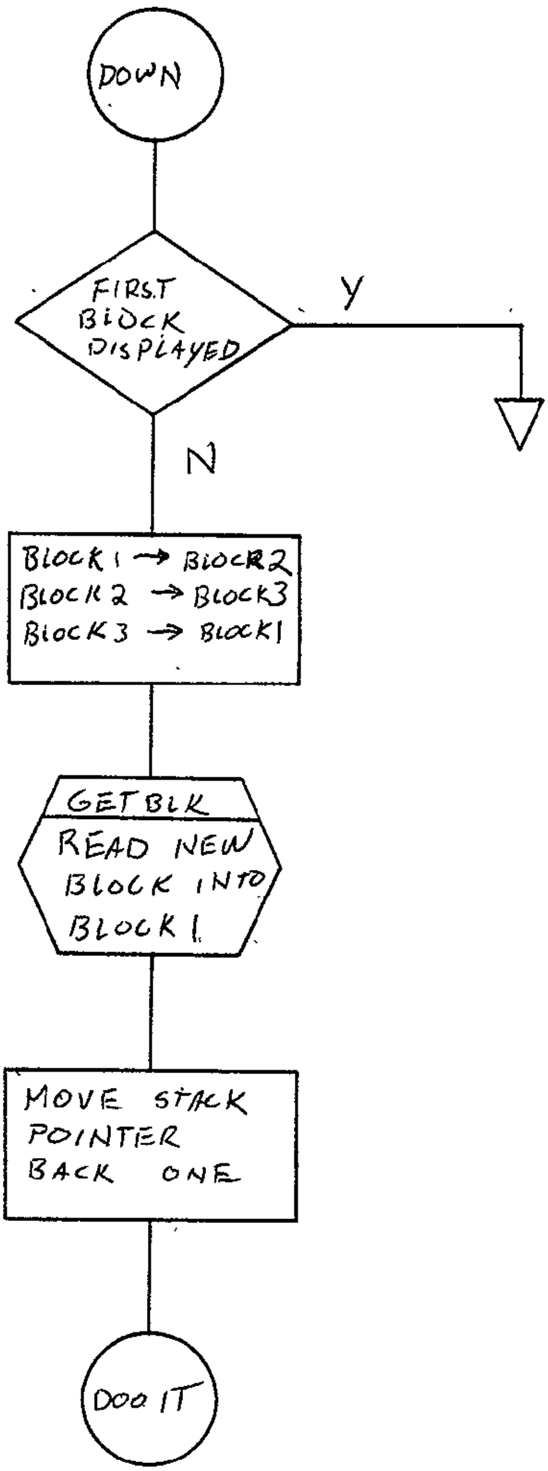

DABC
GETBLK
READ SECOND BLOCK
SET ADDRESSES FOR 3RD BLOCK
GETBLK
READ 3RD BLOCK
SET UP STACK POINTER
DOO IT

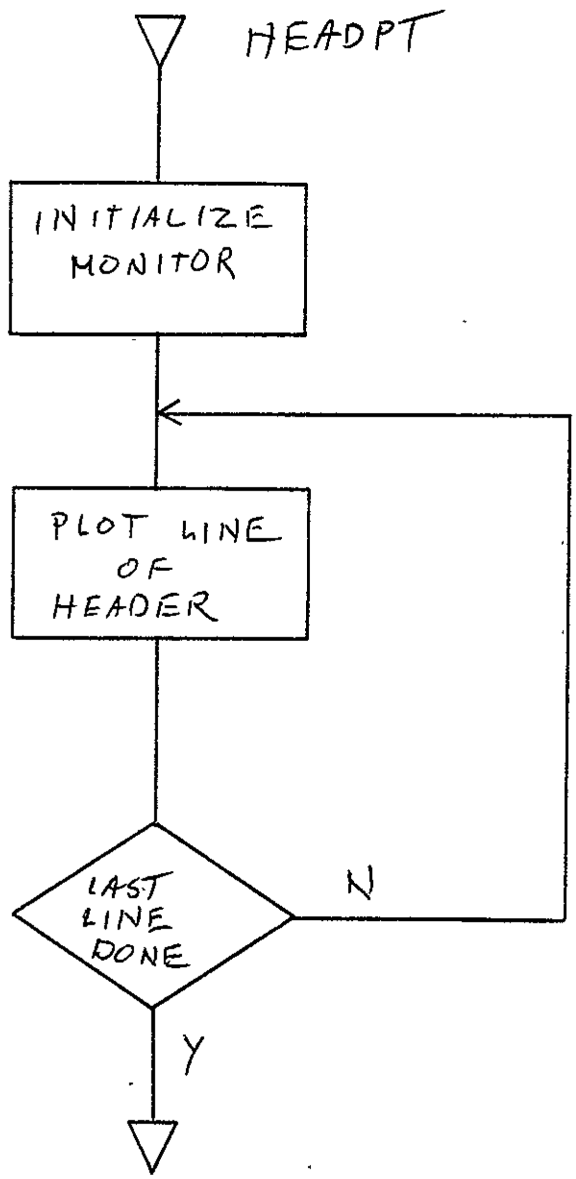

DOOIT
CHEC
CHECK FOR OPERATOR REQUEST
SET DACS TO START POSITION
HEADPT
FLASH HEADER
DISBLK
FLASH BLOCK
LAST BLOCK
N
Y
DOOIT


CHEC
CHAR ENTERED
N
Y
CNTRL D
Y
MDBUG
N
CNTRL I
Y
MONINT
N
ASCII N
Y
UP
N
ASCII B
Y
DOWN
N

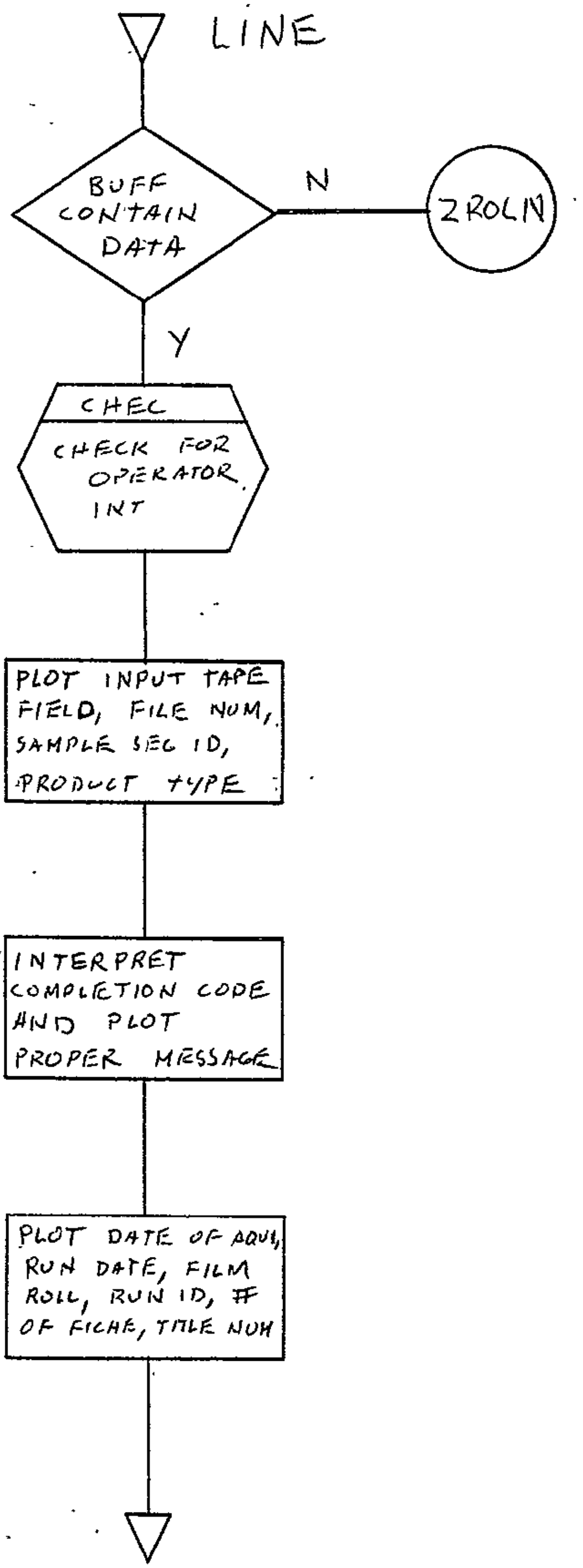

GETBLK
DISK CONTROLLER READY
N
Y
LOAD ADRS (MEMAD)
LOAD WORD COUNT
LOAD COMMAND (DSCAD)
CONTROLLER READY
N
Y
DATA GOOD
N
DDSKRD
Y

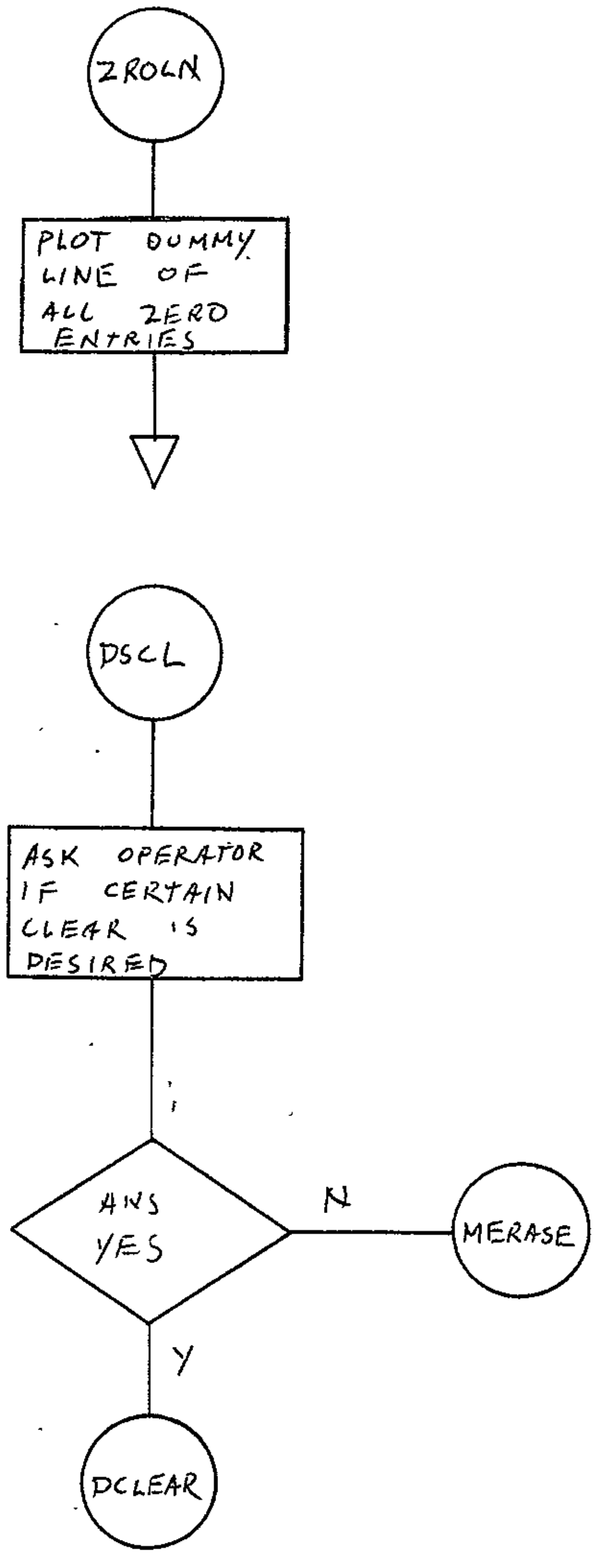

UP
LAST BLOCK DISPLAYED
Y
N
BLOCK2 → BLOCK1
BLOCK3 → BLOCK2
BLOCK1 → BLOCK3
GETBLK
READ NEXT BLOCK INTO BLOCK3
UPDATE STACK POINTER, SAVE NEW CHAIN WORD
DOOIT

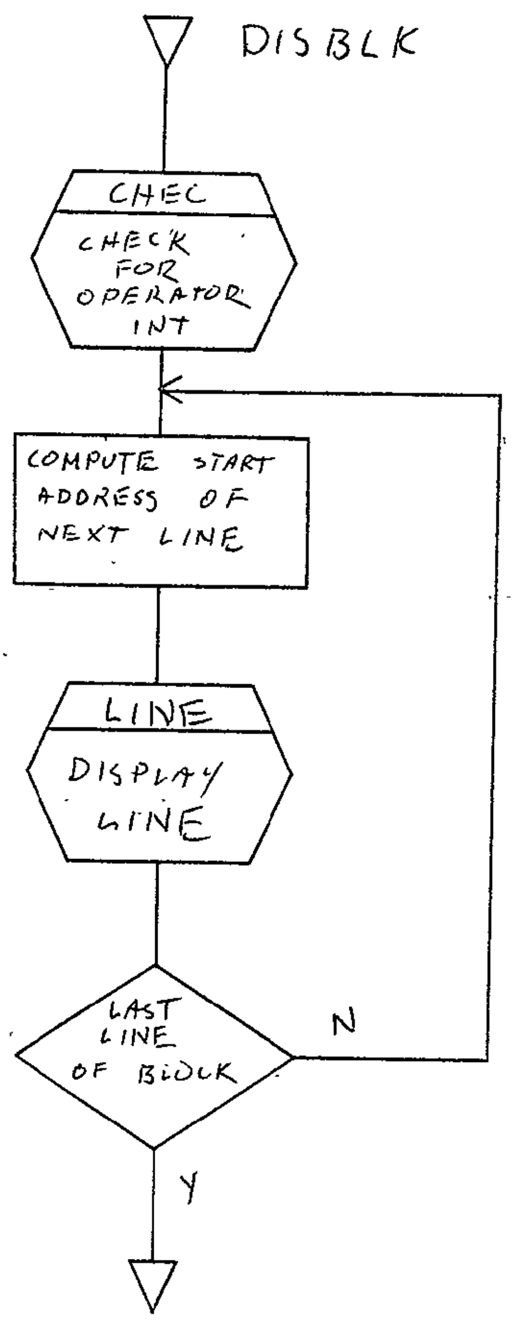

DOWN
FIRST BLOCK DISPLAYED
Y
N
BLOCK 1 → BLOCK 2
BLOCK 2 → BLOCK 3
BLOCK 3 → BLOCK 1
GETBLK
READ NEW BLOCK INTO BLOCK 1
MOVE STACK POINTER BACK ONE
DOO IT



REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR


LINE
BUFF CONTAIN DATA
N
ZROLN
Y
CHEC
CHECK FOR OPERATOR INT
PLOT INPUT TAPE FIELD, FILE NUM, SAMPLE SEQ ID, PRODUCT TYPE
INTERPRET COMPLETION CODE AND PLOT PROPER MESSAGE
PLOT DATE OF AQUI, RUN DATE, FILM ROLL, RUN ID, # OF FICHE, TITLE NUM


ZROLN
PLOT DUMMY LINE OF ALL ZERO ENTRIES
DSCL
ASK OPERATOR IF CERTAIN CLEAR IS DESIRED
ANS YES
N
MERASE
Y
DCLEAR


DISBLK
CHEC
CHECK FOR OPERATOR INT
COMPUTE START ADDRESS OF NEXT LINE
LINE
DISPLAY LINE
LAST LINE OF BLOCK
N
Y

2.15 COMA LACIE PRINT PROCESSOR FOR 105 mm FICHE (LACPRT)

2.15.1 Background

A. Author. F. C. Ashton, Aeronutronic Ford Corp.

B. Intent. Requested when LACIE print is to be output to 105 mm fiche.

C. Program History

1. Production Tape Date. 1 April 1975
2. Author. F. C. Ashton
3. Authorization. NASA/JSC Form 994, Transmittal/ Information Request Form No. 2791
4. Test Case. TPS No. A16
5. Revisions. Reference Appendix B, paragraph B.15

2.15.2 Introduction

2.15.2.1 Hardware Requirements

- FR80 with 12K memory
- 9-track tape unit
- 105 mm fiche camera
- Disk.

2.15.2.2 Software Requirements. The following files found in I.I.I.'s SYM Directory are required:

PRINTF COM	III164	III162	III186
III109	III163	III161	ASROUT
III166	III185	III188	
DISK STATUS	III147	III161 GO	

2.15.2.3 Assembly Parameters. The asse should be set for the proper machine configuration. Assembly parameters specific to LACPRT program are as follows.

A. TWOBUF. If 1, indicates double buffer.

B. FASSTTY. If 1, defines program interrupt teletype controls.

C. PTYPE. If 3, indicates EBCDIC forms.

D. FONT. If 0, indicates standard I.I.I. character font.

E. TAPELB. If 1, indicates standard IBM tape labels.

F. NASA. If 1, indicates special characters used at JSC.

G. EBCDIC. If 1, indicates standard IBM EBCDIC character set

H. LOCASE. If 1, indicates lower case character set.

I. BIGBUF. If 0, allows maximum amount of features with min mum buffer space.

J. MTSIZE. Defines length of system tape buffers (513 words

K. MTTSIZ. Defines length of teletype buffer (192 words).

L. MANYUP. Indicates that page count is printed with frame count when the accounting information is output to the teletype.

M. FTYPE. Indicates the fiche camera.

N. DSKMON. Indicates the disk monitor routine to be assembled.

O. NEXPAG. Equivalent to NEXPIC Routine.

P. 7-TRACK. If 0, indicates no 7-track code to be assembled

Q. 9-TRACK. If 1, indicates 9-track code to be assembled.

R. MUMBLE. If 1, indicates that during assembly time print commands are output to TTY.

S. ALLOW. Defines number of words for save index information (2123).

T. TITLE. If 1, indicates title code to be assembled.

U. FINDEX. If 1, indicates index code.

V. NDXBLK. If 7, indicates number of words per index entry.

2.15.2.4 Operator Commands

```
*
*TIME=4:52'2.6"
*FRAME=0
*CURRENT PAGE=0
*GO
*CONTINUE
*TITLE
*END JOB
*MAKE FILM=1
*CLEAR
*ADVANCE
*BACK
*USE=1
*REWIND
*SKIP
*TRY AGAIN=10
*STANDARD LABELS=YES
*UNLABELLED=NO
```

```
*FORM=   NUL105
*INDEX FORM=   LACIND
*ERROR FORM=NO
*PITCH-MARGIN=35,52
*SIZE OF TITLE=7175,6150
*IMAGES PER FICHE=16,14
*HITS-CHARS,VEC,PTS,TITLE,CMARK=1,1,1,2,1
*FOCUS
*LOAD=LACPRT
*ROTATION=0
*WIPE OUT STATUS BLOCK
*DUMP STATUS TAPE
*STATUS JOBS (0=YES,1=NO)=0
*SEARCH TITLE(0=NO,1=YES, TITLE NO.)=0,0
*TERMINATION DUE TO ERROR
*NEXT TITLE
```

2.15.3 Analysis

2.15.3.1 Major Control Section

A. Description. Control is given to the LACPRT Program at location BEGIN. The program clears the status buffer, STABUF to EBCDIC spaces. The title number, BSTNO, and total fiche per title, BFICTOT, are set to zero. A (-1) is stored in location RECRT for record number. A call is made to subroutine INSET6 to set the print intensity. Then a call is made to the TOPPAG Subroutine to set the lines per page and the X and Y coordinates. The Tape Handler Subroutine is initialized by calling MTRINI. The fiche controller is initialized, and the fiche advances one blank fiche. Then a call is made to input the calendar date and calculate the Julian date and to TTAPNO to accept the tape number. The spacing and rotation is set by calling SETPLS. The main print lcop consists of subroutines RECGET, CKCOM, ACODE and RRTLN. The RECGET Subroutine gets one logical record at a time from the tape handler. The CKCOM Subroutine checks for COM control records and processes the COM controls. ACODE translates the first character of print image record as carriage control. The PRTLN Subroutine outputs the print image to fiche.

B. Input/Output

1. Input data is input from a 9-track tape drive. The tape can be standard IBM label, nonstandard label or unlabeled. The data is in a fixed-length record format (blocked) with 931 eight-bit bytes per block. Each logical record will be 133 bytes in length. A logical record contains a COM control record or print image record. A COM control record can be a job separator record, a title record, or an indexing record. A print image record is 133 bytes, with the first byte containing the standard ASCII carriage control and last 132 bytes containing EBCDIC characters.

2. Output. Output of data is to 105 mm fiche. The fiche contains 16 rows by 14 columns; the first row of data is title information.

3. Tape Output. The status of each job is output to tape. The status contains the job ID, the number of fiche output, the job number, and date of run. Each status record is 66 bytes long.

4. Message Output

   a. TITLE ERROR. This is output to the teletype when the title record is in error.

   b. TITLE INFORMATION. This is output to the teletype along with JOB ID NO.

c. ENTER TAPE NUMBER. This is output to the teletype and the machine waits for an answer, giving the source tape number. The operator types up to six characters of information.

d. ENTER DATE. This is output to the teletype, and the machine waits for an answer, giving the calendar date. The operator types up to six characters of information in the format MM/DD/YY.

C. Linkages

1. External

Routine	Program
ACCTG	III166
FCFIN	III166 ADVAN
FC7CLR	III166 ADVAN
FICTAP	III188
FRSPIC	III166 ADVAN
GETIN	III161
GETNUM	III161
KYBLIS	III166
MDONEX	III166 INVAN
MDOUT	III166
MCRLF	III166 ADVAN
MMESSG	III166 ADVAN
MONOUT	III166 INVAR
MTRINI	III163
MTLAC	III163
NEXPIC	III166 ADVAN
MNBRIT	III166
PSTLL	III166
ROTATE	III166
SETPLS	III166
SETXYS	III166

2. Internal Routines

ACODE	DDST	JULDAT	TITNX
BLDREC	ERRTRM	LACEOV	TOPPAG
CARCON	FICOUNT	LACEND	TOTTY
CKCOM	FRFLAS	LEAP	TTAPNO
CHRGET	GTFNDX	MVCOM	TTCHAR
CHROUT	INSET3	PRTLN	TTTINT
COMEND	INSET6	RECGET	TTTPUT
COMOST	INXCK	STNQYE	TTTWD
CONVER	JOBERP	STNENO	TYPFRX
DDCL	JOBSTU	STUJOB	

2.15.3.2 Subroutines

A. ACODE. Translates ASCII carriage control (EBCDIC character) to line spacing as follows.

- + = overprint
- Space = space one line
- 0 = space two lines
- - = space three lines
- 1 = skip next frame
- Any other character = space one line.

This subroutine sets the parameter CARCNT (carriage counts, or the right number of line spacings). When the carriage control is 1, the parameter LNCT (lines per frame) is set to -1. Calling sequence: JMS ACODE/CARRIAGE CONTROL IN AC.

B. BLREC. Builds the status buffer from the title stored in the title area. When the switch, BLDSW, is set to a NOP, the status is not built. When BLDSW is set to a SKP, the status buffer is built. Calling sequence: JMS BLREC.

C. CARCON. Does the line spacing for the frame of data. The subroutine is called after the ACODE Subroutine. The line spacing is contained in CARCNT. This subroutine counts the lines per frame in LNCT and does a frame advance when a total of 64 lines is reached. Calling sequence: JMS CARCON

D. CKCOM. Processes all COM control records (i.e., separator records, title records and index records). Calls MVCOM Subroutine to move separator and title records into the title area, and appends the tape number to the separator information, The routine does not return control to the main program until a print image (non-COM control record) is detected. Calling sequence: JMS CKCOM

E. CHRGET. Gets one character at a time from tape buffer. The character is returned to AC and MQ. Calling sequence: JMS CHRGET

F. CHRPUT. Stores a character at a time in the status buffer. Index register 12 contains the address of word that character is to be stored. The switch SWWCH tells in which part of the word to store the character (NOP in the second half, SKP in the first half). Calling sequence:

```
LAC CHARACTER
JMS CHRPUT
```

G. COMEND. Called to end fiche when in the title search mode. Calling sequence: JMP COMEND

H. COMOST. Converts the binary fiche count and title number to EBCDIC. Calls STATUS to write status buffer to disk. If there has been a new reel mounted, the new tape number is moved to separator area. Calling sequence: JMS COMOST

I. CONVER. Converts a three-digit binary number to EBCDIC number (one byte per word). Calling sequence:

```
LACA ADDRESS OF EBCDIC BUFFER
JMS CONVER
LAC BINARY VALUE
```

J. DDCL. Jumps to clear number which wipes disk status block clean. Calling sequence: JMP DDCL

K. DDST. Jumps to DDMT, which writes the disk status to tape. Calling sequence: JMP DDST

L. ERRTRM. Called when the run is aborted. Sets the error flag and writes out the status to disk. Calling sequence: JMP ERRTRM

M. FICOUNT. Adds 1 to fiche count when fiche is ended. Calling sequence: JMS FICOUNT

N. FRFLAS. Flashes index forms. Calling sequence: JMP FRFLAS

O. GTFNX. Jumps to GTFRIX to load index forms. Calling sequence: JMP GTFNX

P. INSET3. Sets the title intensity to 24. Calling sequence: JMS INSET3

Q. INSET6. Sets the print intensity to 48. Calling sequence: JMS INSET6

R. INXCK. Checks each print line for the index line. If the print line is to be indexed, the subroutine calls INXDO to save off index from print line. Calling sequence: JMS INXCK

S. JOBERR. Dummy subroutine used to display TERMINATION DUE TO ERROR. Calling sequence: JMS JOBERR

T. JOBSTU. Displays title search parameter, TITWD, and title number to be searched, I. Calling sequence: JMS JOBSTU

U. JULDAT. Accepts from the teletype the date of the run and calculates the Julian date. Calling sequence: JMS JULDAT

V. LACEOV. Entered from Tape Read Subroutine when a new reel of job has been mounted. The subroutine accepts the new tape number, and sets LATPCH in the subroutine COMOST to move the new tape number into the status buffer after the old status buffer is written out. Calling sequence: JMS LACEOV

W. LACEND. Entered when end-of-file is detected on standard label files. The subroutine finishes the last fiche and writes the last status buffer to disk. Calling sequence: JMS LACEND

X. LEAP. Entered when a leap year will affect the Julian date; adds 1 day when the number of the year is divisible by 4. Calling sequence: JMS LEAP

Y. MVCOM. Moves COM control information to title area and saves the address where the title information is stored. Calling sequence: JMS MVCOM

Z. PRTLN. Outputs a print image line to film and calls CARCC to set line spacing. Calling sequence: JMS PRTLN

AA. RECGET. Gets a logical record from the tape buffer. The table RECPRT contains the address of each logical record. The subroutine loads the address of logical record in CHRADD and puts the first character of the record in AC and MQ. The routine calls MTLAC when physical record is required. Calling sequence: JMS RECGET

BB. STNOYE. Displays the flag STANN for a status job. Callin sequence: JMS STNOYE

CC. STYENO. Entered when STATUS JOBS is typed in; sets BLDSW (NOP for nonstatus jobs and SKP for status jobs). Calling sequence: JMP STYENO

DD. STUJOB. Sets the title number for search title command. Calling sequence: JMP STUJOB

EE. SENEXT. Searches down to next title when the NEXT TITLE command is given. Calling sequence: JMP SENEXT

FF. TITNX. Dummy subroutine to display the next title. Calling sequence: JMS TITNX

GG. TOPPAG. Sets the beginning X and Y coordinates for a fram and sets lines per frame to 64. Calling sequence: JMS TOPPAG

HH. TOTTY. Outputs messages to the teletype and waits for input from it. Calling sequence: JMS TOTTY

II. TTAPNO. Outputs to the teletype the message ENTER TAPE NUMBER and waits for six-digit input. Calling sequence: JMS TTAPNO

JJ. TTCHAR. Translates an eight-bit EBCDIC character into a six-bit ASCII character. Register 11 is loaded with the address of the buffer containing the EBCDIC character. Calling sequence:

```
JMS TTCHAR
DAC CHARACTER, 6-BIT ASCII
```

KK. TTTINT. Initializes the teletype output buffer. Calling sequence: JMS TTTINT

LL. TTTPUT. Stores three ASCII characters per word to teletype. Calling sequence:

```
LAC ASCII CHARACTER
JMS TTTPUT
```

MM. TTTWD. Sets character count TTTCT to 3. Calling sequence: JMS TTTWD

NN. TYFPRX. Displays index form name. Calling sequence: JMS TYFPRX

2.15.3.3 Constants and Variables

A. External

1. CHDELX. Variable that contains X spacing.
2. CHDELY. Variable that contains Y spacing.
3. CHRSIZ. Variable that contains character size.
4. CHRSZ. Variable that contains character size.
5. CURBUF. Variable pointer to current tape buffer address.

6. DECNUM. Variable that contains decimal binary number after BEGIN converts ASCII to binary.

7. EXPND. Buffer used by Indexing Subroutine.

8. GOND. Buffer used by Indexing Subroutine.

9. FC7SUB. Instruction change (add two) when initializin the fiche camera in III186. Changes back to "subtract one" during run.

10. FCENDJ. Instruction to jump to UNLEND for the unlabeled end-of-job routine.

11. FICTB. Table for title buffer.

12. FRAMNM. Variable frame count.

13. INXDO-1. Instruction to jump to FISCOUNT. Add to frame count.

14. LEFTX. Constant starting X coordinate.

15. MAXTRW. Variable used by III185 Title Routine; program initializes MAXTRW to zero.

16. MCHTAB. Table for six-bit ASCII teletype codes.

17. MDISIZ. Constant character size of monitor display (63).

18. MDISPL. Constant spacing between character on monitor display (384 scope points).

19. MTCNT. Variable number of words remaining in tape buffer.

20. MTEOF2. If -1, instruction to jump to LACEOV, the Standard Label End-of-Volume Routine.

21. NEXBUF. Variable pointer to next tape buffer.

22. PBUFSZ. Constant; the number of words in the tape buffer (466).

23. PGNAME. Constant; the program name LACPRT.

24. RECPIN. Variable to hold the intensity.

25. REWCOM. Rewind constant for tape handler.

26. SPCNUM. Constant containing Y spacing.

27. VCHTAB. Table used to convert EBCDIC to ASCII.

28. TEOF. Instruction to jump to LACEND, the End Fiche Routine.

29. TEOV-1. Instruction to jump to LACEOV, the End-of-Volume Routine.

30. TITARE. Constant pointer to temporary title buffer.

31. TPOINT. Variable pointer to title buffer.

32. TOPY. Constant containing Y starting coordinate.

33. XFOFF. Constant containing X offset.

34. YFOFF. Constant containing Y offset.

B. Internal

1. ACTADD. Variable; actual address of logical record.

2. BLDSW. Switch; when set to NOP, indicates status buffer is not to be output to disk; when set to SKP, indicates status buffer is to be output to disk.

3. BFITOT. Variable containing binary fiche count.

4. BSTNO. Variable containing binary number of title count.

5. CARCNT. Variable number of spaces between lines.

6. CHRADD. Variable address of current word in logical record.

7. CHRSAV. Variable used for temporary storage for second character of logical record.

8. CHRSW. Switch; when set to NOP, second character of logical record is unpacked; when set to SKP, first character of logical record is unpacked.

9. COMCHR. Constant hexadecimal D9 COM control character.

10. COMINS. Contains instruction LAC BSTNO or LAC SVBNO.

11. COMESW. Switch; set to NOP for multi-title or to SKP for single title jobs.

12. COMSW. Switch set to NOP for multi-title or to SKP for title search.

13. DATADD. Buffer to hold Julian date.

14. DAY. Number of days entered.

15. DAYTAB. Twelve locations used by JULDAT that contain the number of days in each month.

16. ENDATE. Constant containing message ENTER JULIAN DATE.

17. EFMFL. Variable containing pointer for forms.

18. EOTIF. Constant containing message END OF TITLE.

19. FDNDXP. Variable pointer for indexing.

20. FITOT. Variable EBCDIC buffer for fiche count.

21. FRAMF. Variable pointer for indexing.

22. FRMTAB. Variable seven-word table for forms.

23. FXFMFL. Variable pointer for indexing.

24. HLDCHR. Variable used as temporary hold for first character of status word.

25. HOLD11. Variable used as temporary hold for register 11, address in status buffer.

26. IFLASW. Switch; NOP (no indexing) and SKP (indexing).

27. JUL. Table with length of 6; containes calendar date digits.

28. JULA. Pointer to JUL Table used in TOTTY.

29. JULDAT. Julian date calculated by JULDAT Subroutine.

30. LATRCH. Switch; NOP indicates same tape and SKP indicates that a new tape reel has been mounted and the tape number must be moved into status buffer.

31. LINPOS. Variable containing actual line count for indexing.

32. LNCT. Variable containing run count of lines per page

33. LOKDAS. Switch; NOP indicates no check for slash in the title record and SKP indicates to check for slash.

34. MONTH. Month number entered in JULDAT.

35. NAMID. Constant containing message JOB ID NO.

36. PROID. Variable processing indicator (0 = no error; 1 = unrecoverable read error; 3 = recoverable read error).

37. RECADD. Variable containing logical record address.

38. RECRT. Variable containing logical record number.

39. RECSW. Switch; NOP indicates this is the first time the RECGET Subroutine has called; SKP indicates this is not the first time.

40. SAVE11. Variable used as temporary hold for register 11, pointer into title buffer.

41. SAVE12. Variable used as temporary hold for register 12, pointer into status buffer.

42. SEPHLD. Variable pointer to tape number separator record.

43. STANN. Variable containing display status flag.

44. STVBNO. Variable containing save title number.

45. SWWCH. Switch to pack two characters per word in status buffer; NOP indicates first character and SKP indicates second character.

46. TAPBUF. Tape buffer.

47. TEMP. Temporary storage location in LEAP.

48. TITTW. Variable containing title search flag.

49. TITSK. Variable containing title search count.

50. TMPCT. Variable containing working storage count for loop control.

51. TITTY. Teletype buffer for input.

52. TMPHLD. Variable containing holding address of binary number converted to EBCDIC.

53. TORJ1. Switch used in TOTTY: NOP-TOTTY indicates to accept calendar date; JMP TORJ3- accepts and processes tape number.

54. TORJ2. Switch used in TOTTY: JMP ASDEC-TOTTY indicates to process Julian date; NOP indicates no further processing.

55. TPIDNO. Constant EBCDIC message TAPE NO.

56. TTEMP. Variable containing working storage counter.

57. TTPBUF. Variable buffer to hold tape number from teletype.

58. TTPMES. Constant message ENTER TAPE NUMBER.

59. TTTPT. Variable pointer into teletype output buffer.

60. TTTCT. Variable counter containing number of characters per teletype word.

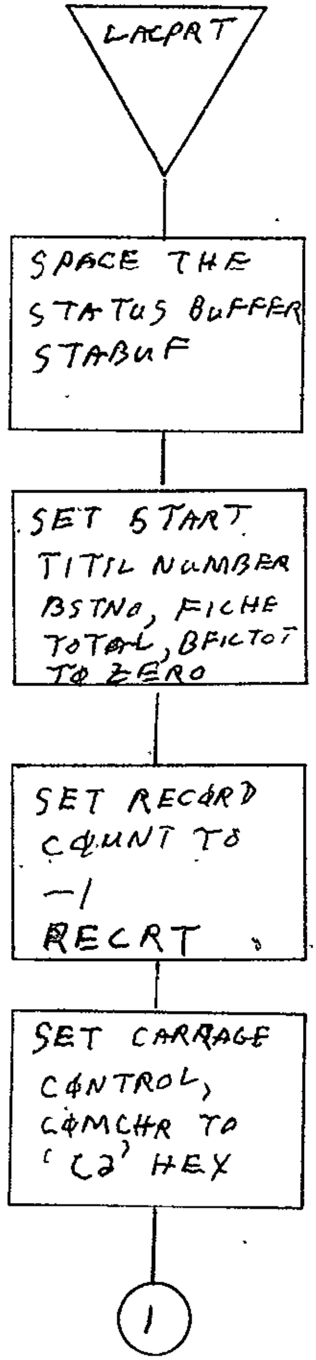
61. WHICR. Switch; indicates which carriage control.

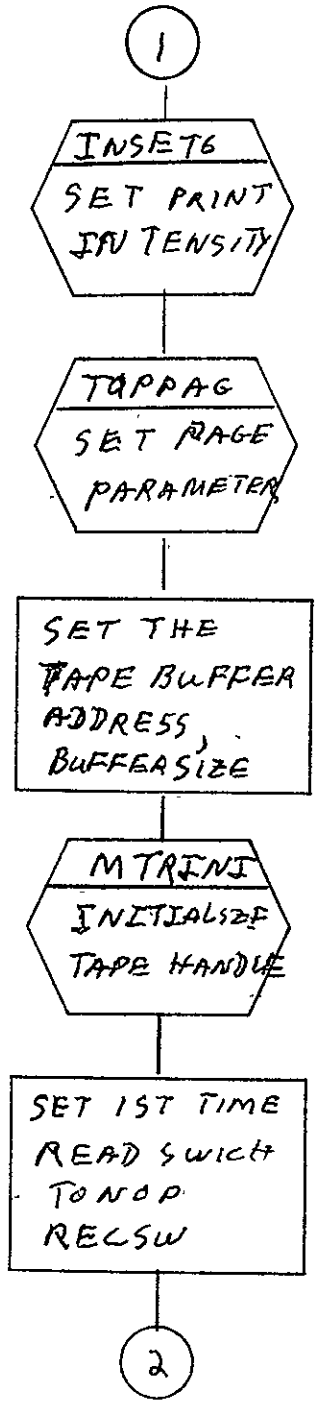
62. XXSAV. Variable X coordinate.

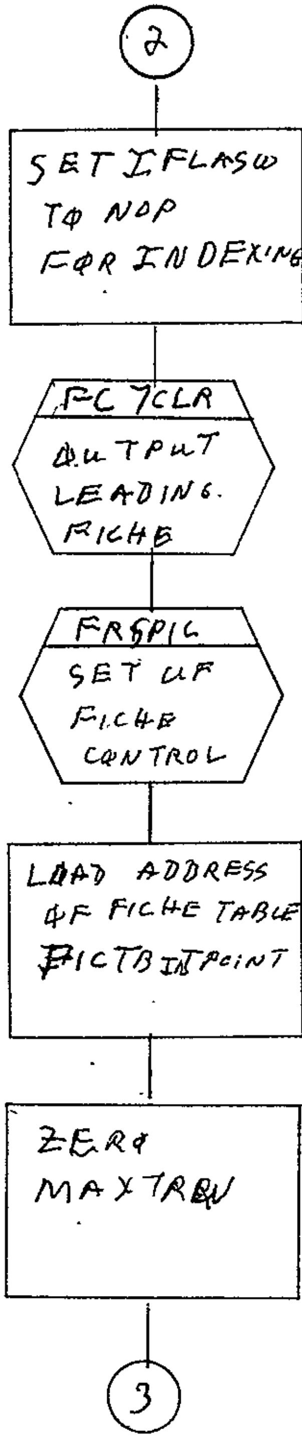
63. YEAR. Year number entered in JULDAT.

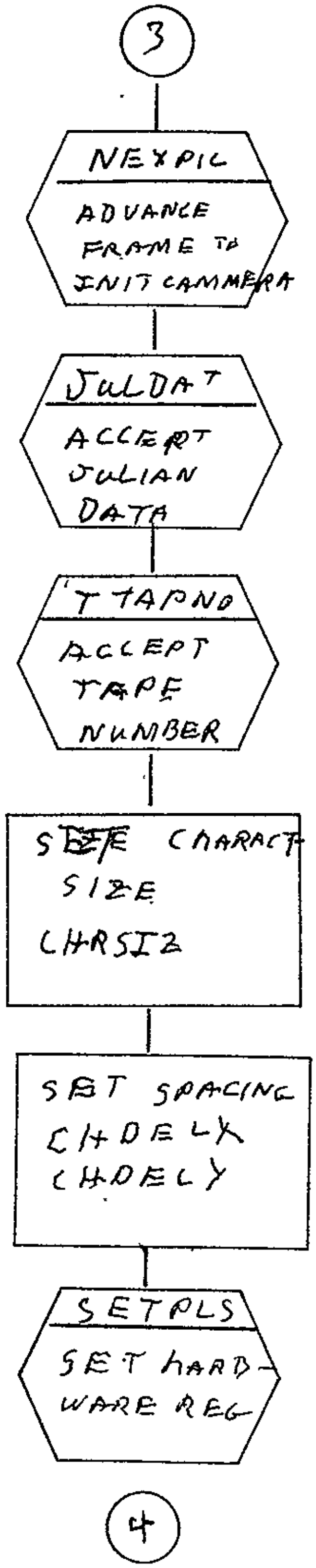
64. YYSAV. Variable Y coordinate.

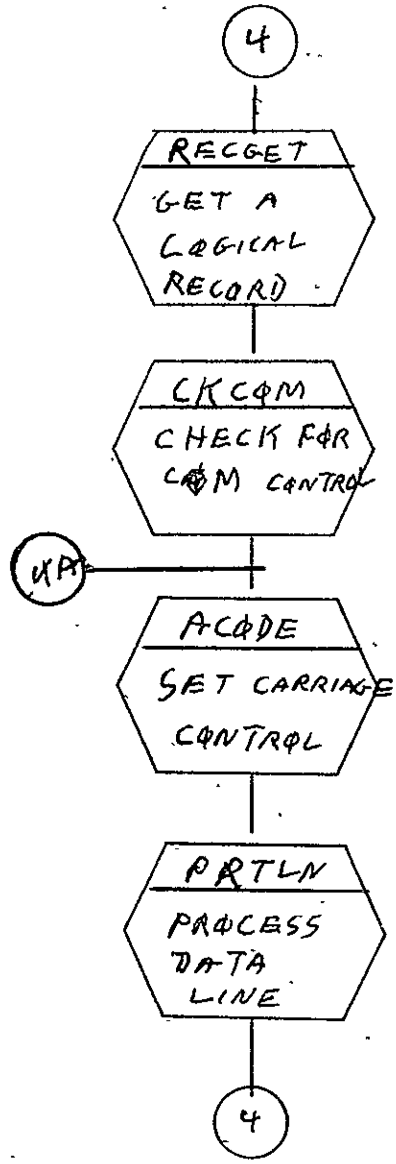
2.15.3.4 Flow Charts. See following pages.

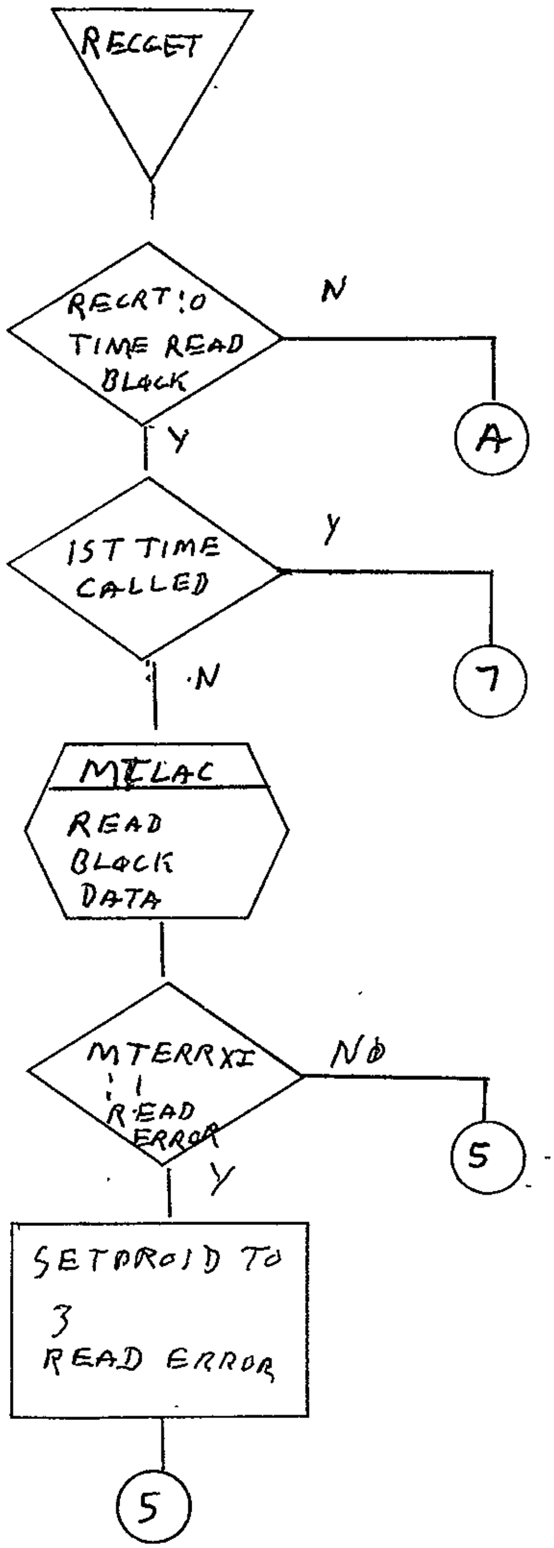

LACPRT
SPACE THE STATUS BUFFER STABUF
SET START TITIL NUMBER BSTNO, FICHE TOTAL, BFICTOT TO ZERO
SET RECORD COUNT TO -1 RECRT
SET CARRAGE CONTROL, COMCHR TO 'C2' HEX
1

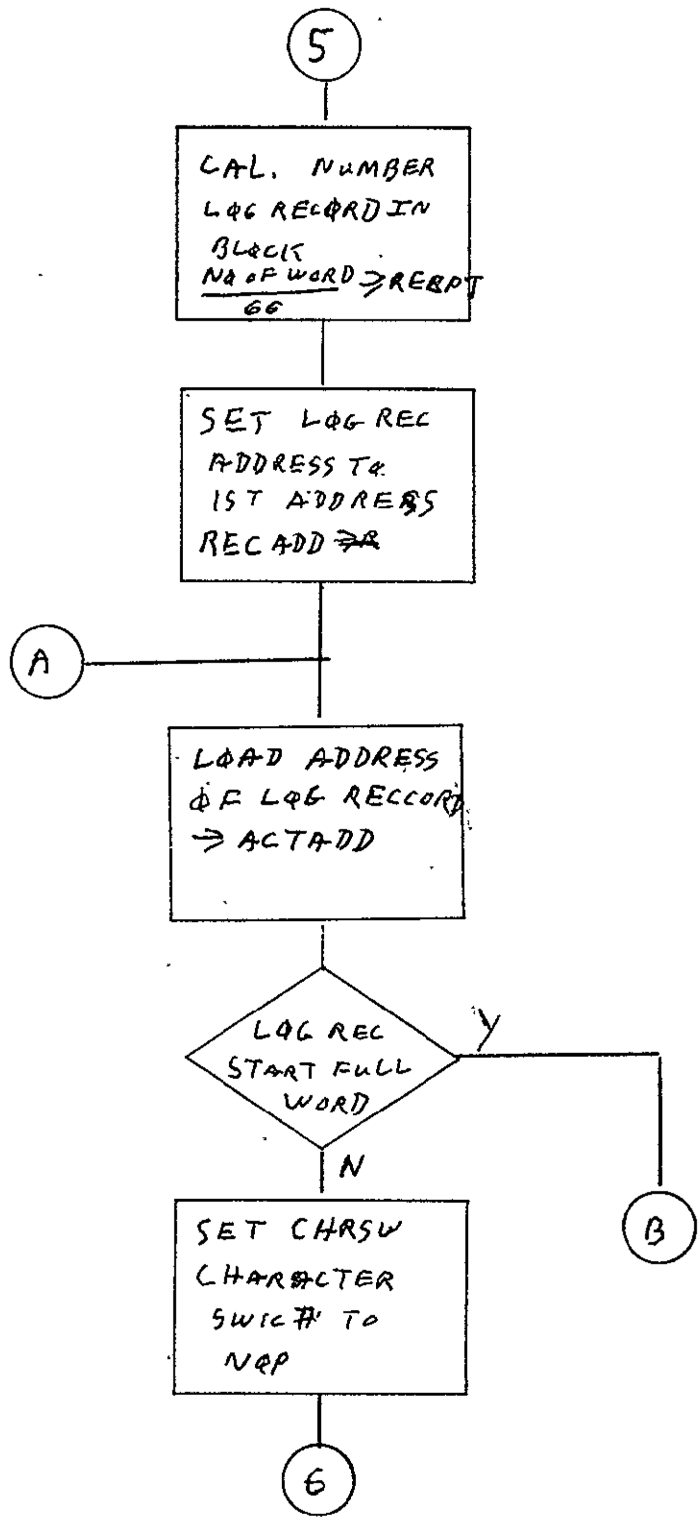

1
INSET6
SET PRINT INTENSITY
TOPPAG
SET PAGE PARAMETER
SET THE TAPE BUFFER ADDRESS, BUFFER SIZE
MTRINI
INITIALIZE TAPE HANDLE
SET 1ST TIME READ SWICH TO NOP RECSW
2

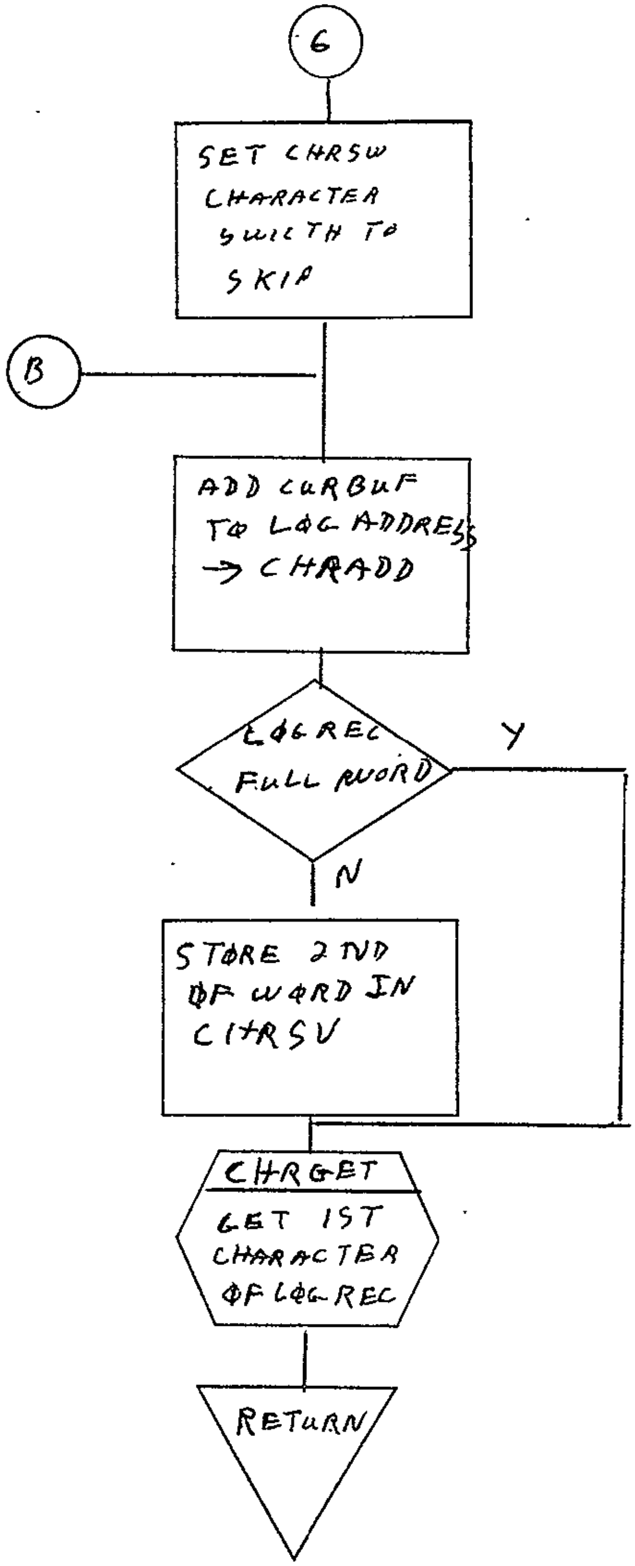

2
SET IFLASW TO NOP FOR INDEXING
FC7CLR
OUTPUT LEADING FICHE
FRSPIC
SET UP FICHE CONTROL
LOAD ADDRESS OF FICHE TABLE FICTB INTPOINT
ZERO MAXTRBU
3

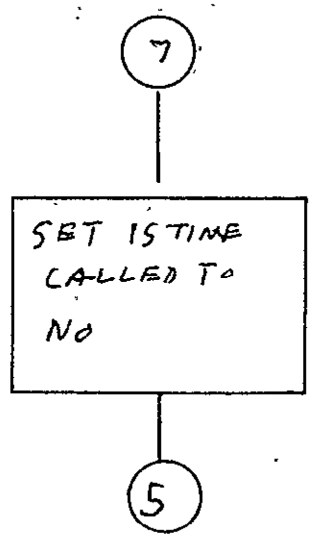

3
NEXPIC
ADVANCE FRAME TO INIT CAMMERA
JULDAT
ACCEPT JULIAN DATA
TTAPNO
ACCEPT TAPE NUMBER
SET CHARACT SIZE
CHRSIZ
SET SPACING
CHDELX
CHDELY
SETPLS
SET HARD-WARE REG
4

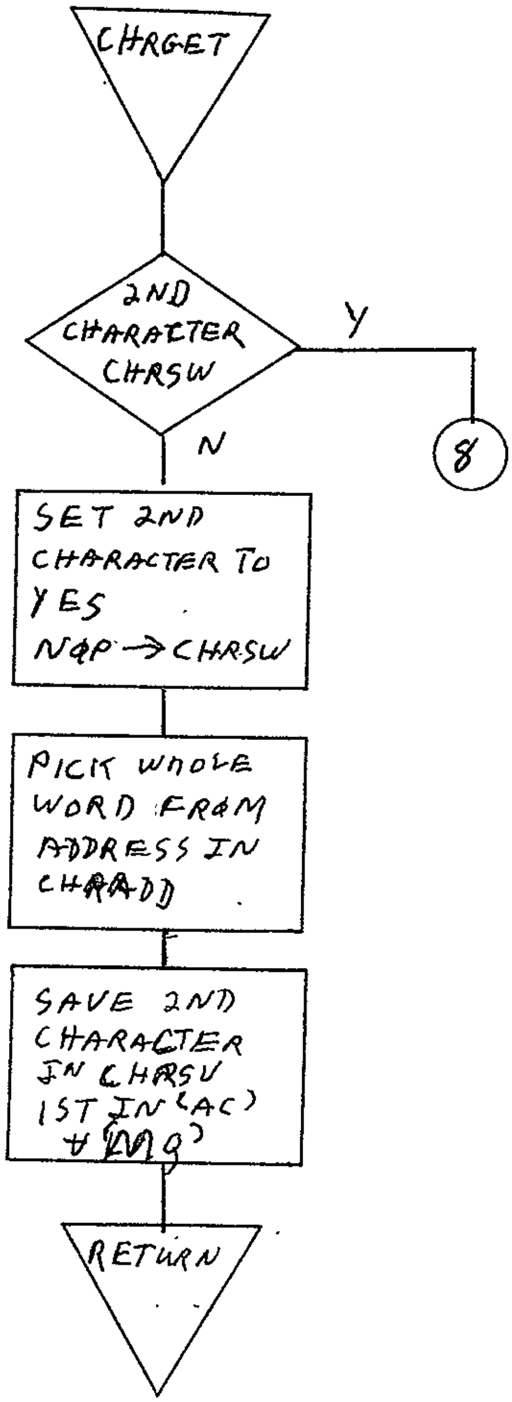

4
RECGET
GET A LOGICAL RECORD
CKCOM
CHECK FOR COM CONTROL
4A
ACODE
SET CARRIAGE CONTROL
PRTLN
PROCESS DATA LINE
4

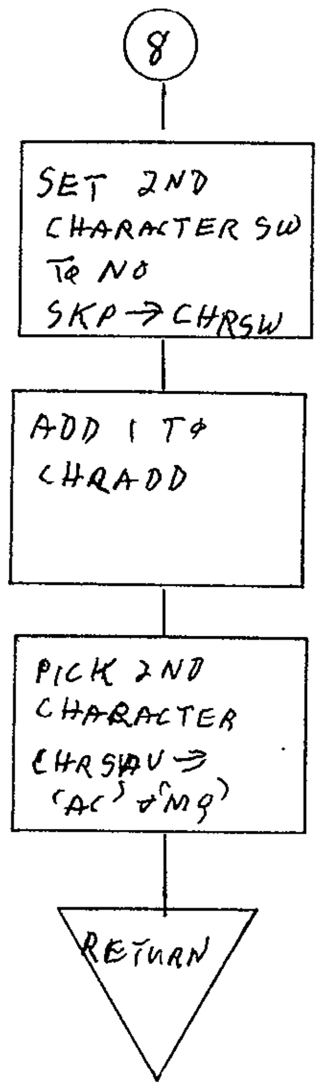

RECGET
RECRT!0 TIME READ BLOCK
N
A
Y
1ST TIME CALLED
Y
7
N
MTELAC
READ BLOCK DATA
MTERRXI !1 READ ERROR
NO
5
Y
SETPROID TO 3 READ ERROR
5

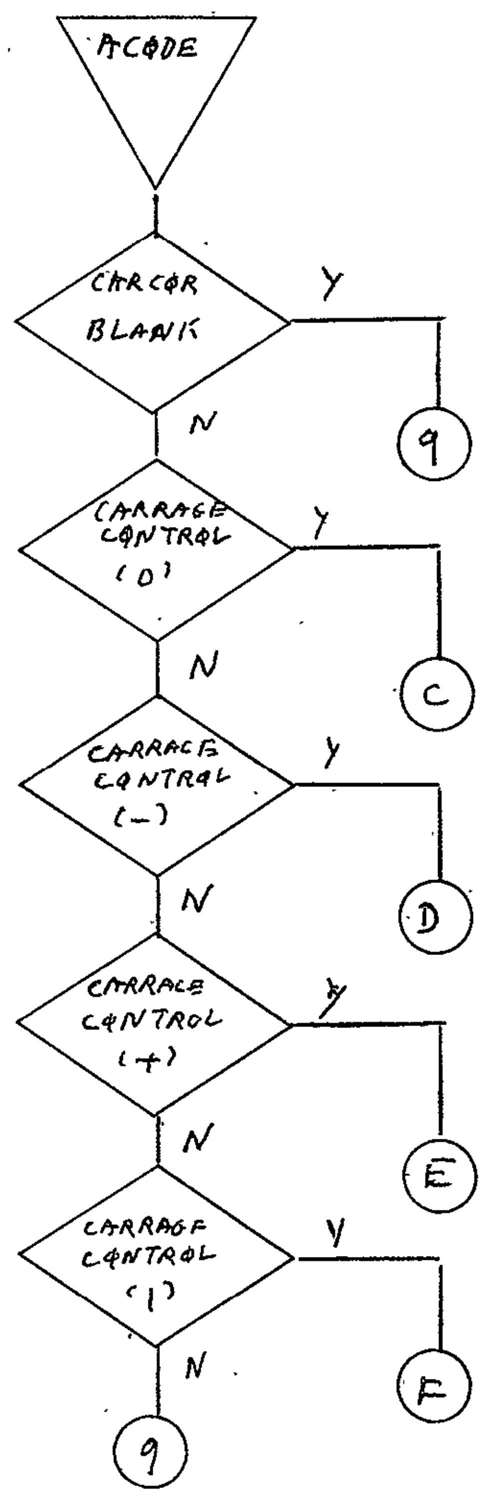

5
CAL. NUMBER LOG RECORD IN BLOCK
NO OF WORD / 66 ⇒ RECPT
SET LOG REC ADDRESS TO 1ST ADDRESS RECADD ⇒ R
A
LOAD ADDRESS OF LOG RECCORD ⇒ ACTADD
LOG REC START FULL WORD
Y
N
B
SET CHRSW CHARACTER SWICH TO NOP
6

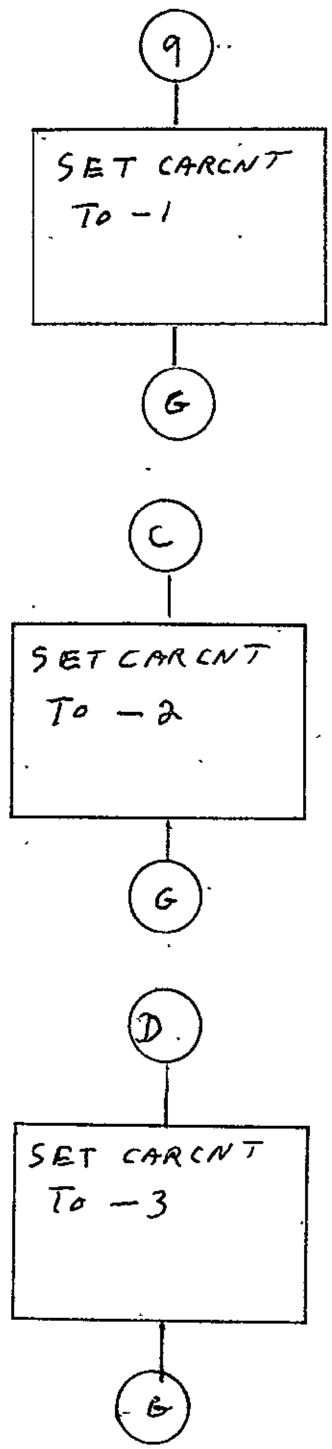

6
SET CHRSW CHARACTER SWITCH TO SKIP
B
ADD CURBUF TO LOG ADDRESS → CHRADD
LOGREC FULL WORD
Y
N
STORE 2ND OF WORD IN CHRSV
CHRGET
GET 1ST CHARACTER OF LOGREC
RETURN

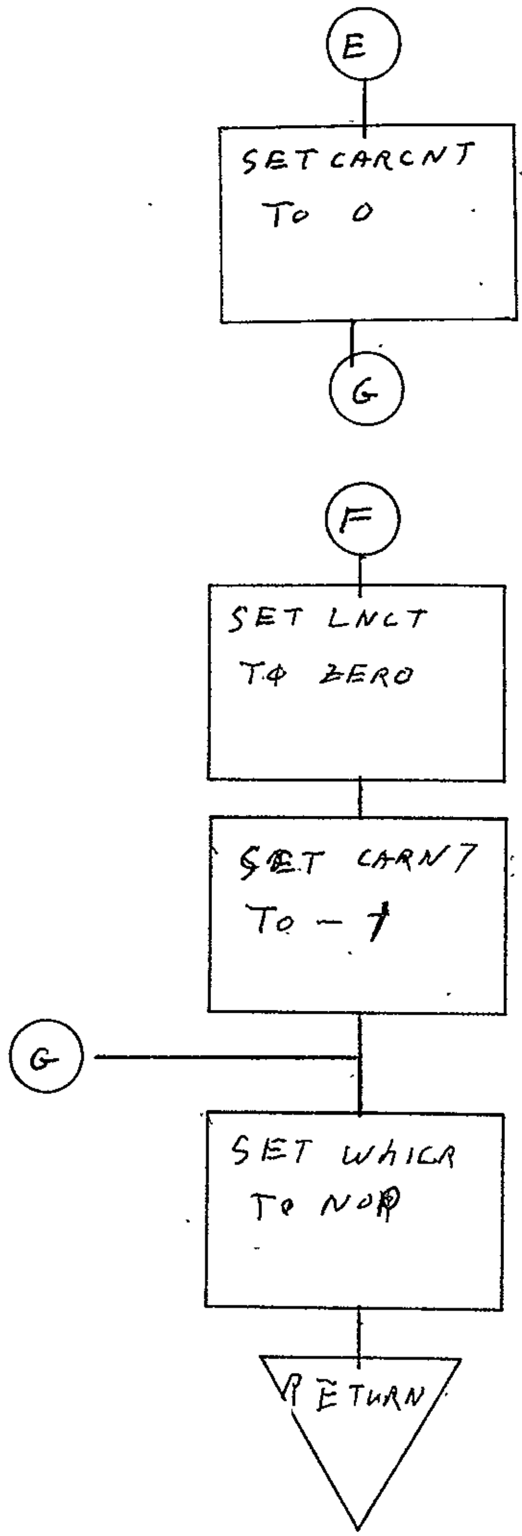

7
SET ISTIME
CALLED TO
NO
5


CHRGET
2ND CHARACTER CHRSW
Y
N
8
SET 2ND CHARACTER TO YES
NØP → CHRSW
PICK WHOLE WORD FROM ADDRESS IN CHRADD
SAVE 2ND CHARACTER IN CHRSV
1ST IN (AC) + (MQ)
RETURN

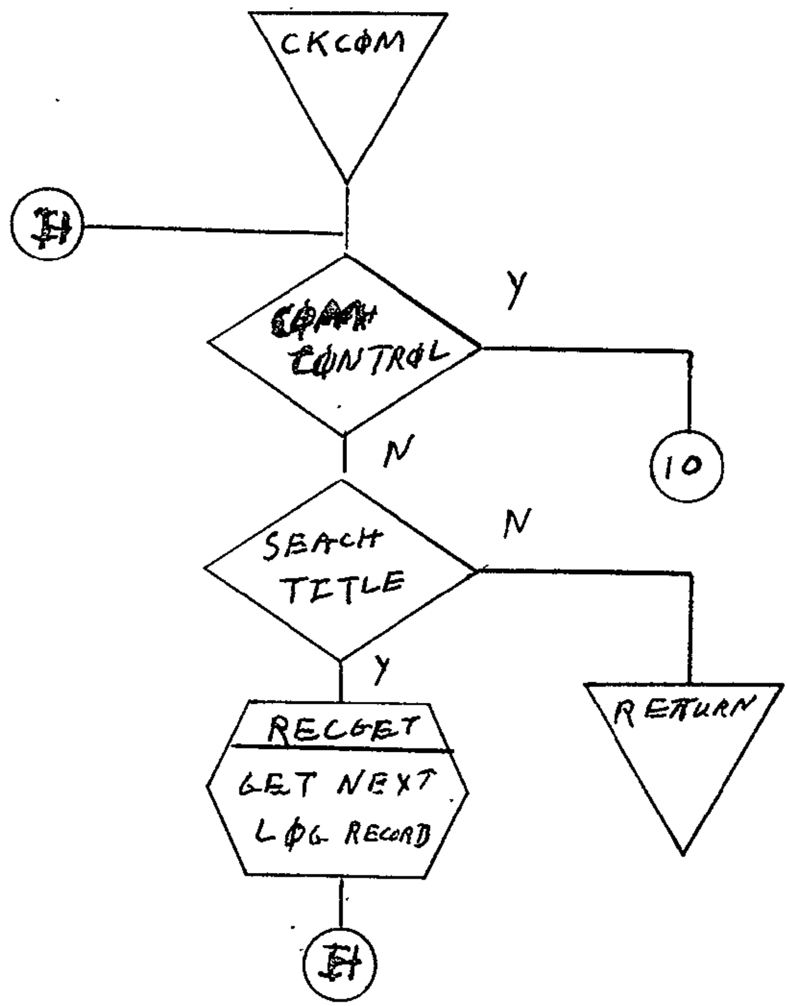

8
SET 2ND CHARACTER SW TO NO
SKP → CHRSW
ADD 1 TO CHRADD
PICK 2ND CHARACTER
CHRSAV → (AC) & (MQ)
RETURN

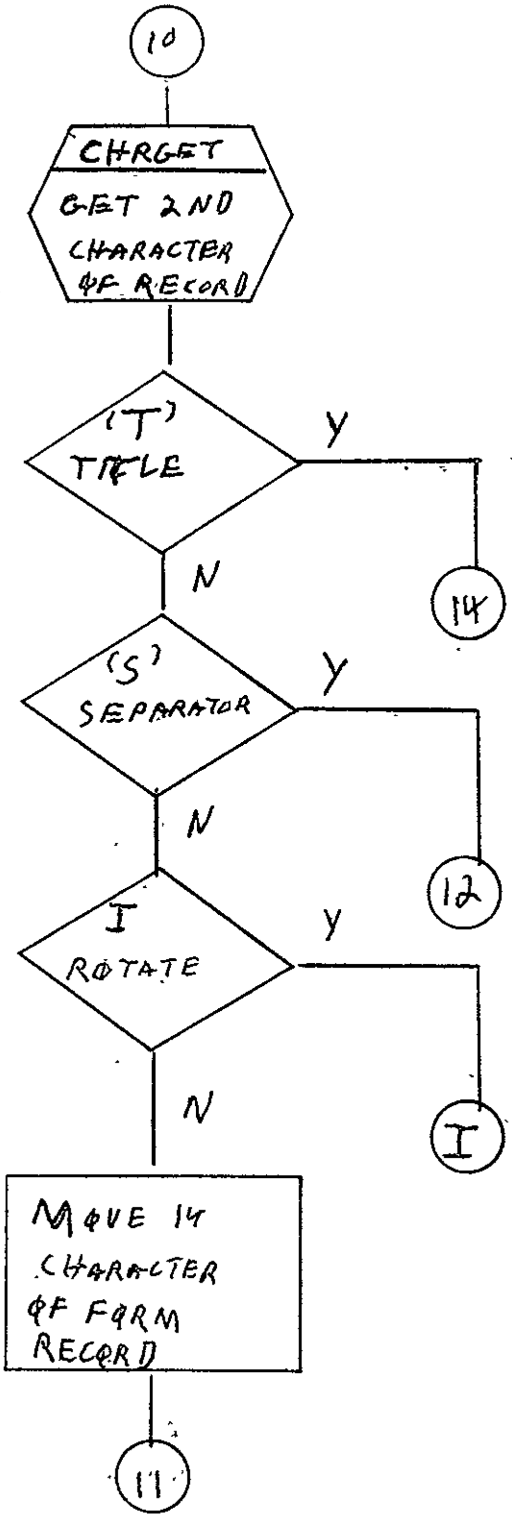

ACODE
CHRCOR BLANK
Y
N
9
CARRAGE CONTROL (0)
Y
N
C
CARRAGE CONTROL (–)
Y
N
D
CARRAGE CONTROL (+)
Y
N
E
CARRAGF CONTROL (1)
Y
N
F
9

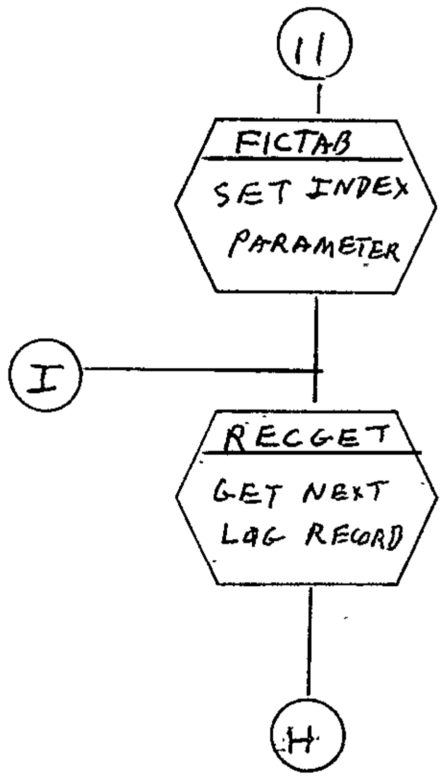

9
SET CARCNT
To -1
G
C
SET CARCNT
To -2
G
D
SET CARCNT
To -3
G

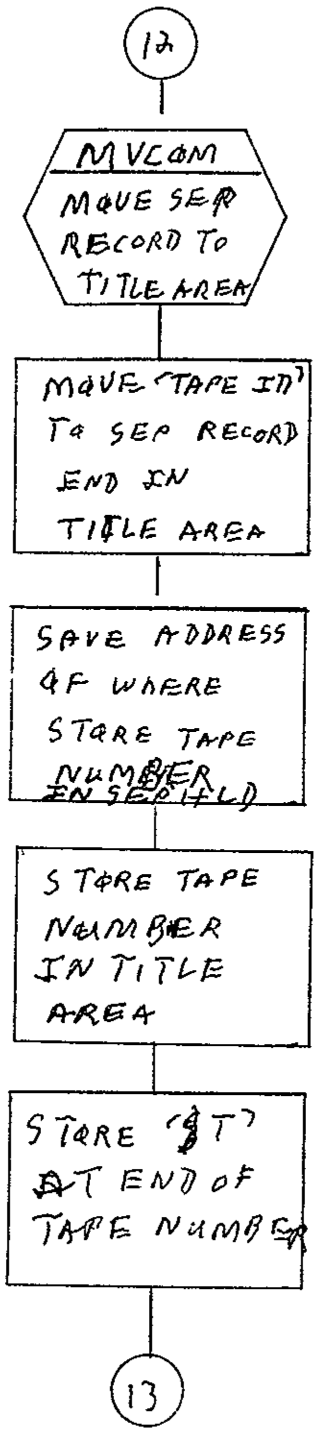


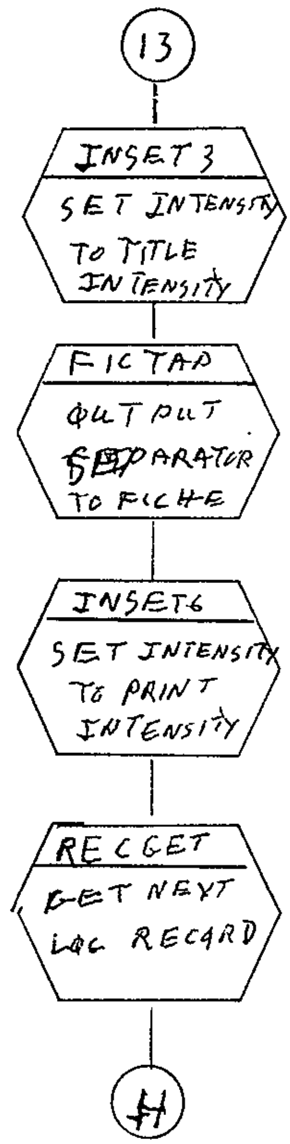
REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR

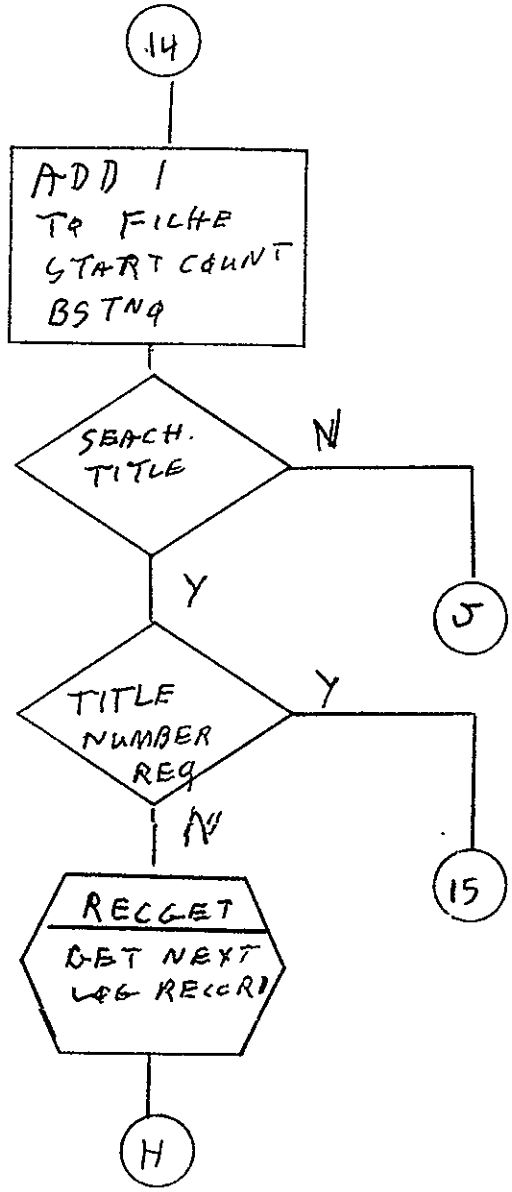

CKCØM
H
COMM CONTRØL
Y
N
10
SEACH TITLE
N
Y
RECGET
GET NEXT LØG RECORD
RETURN
H

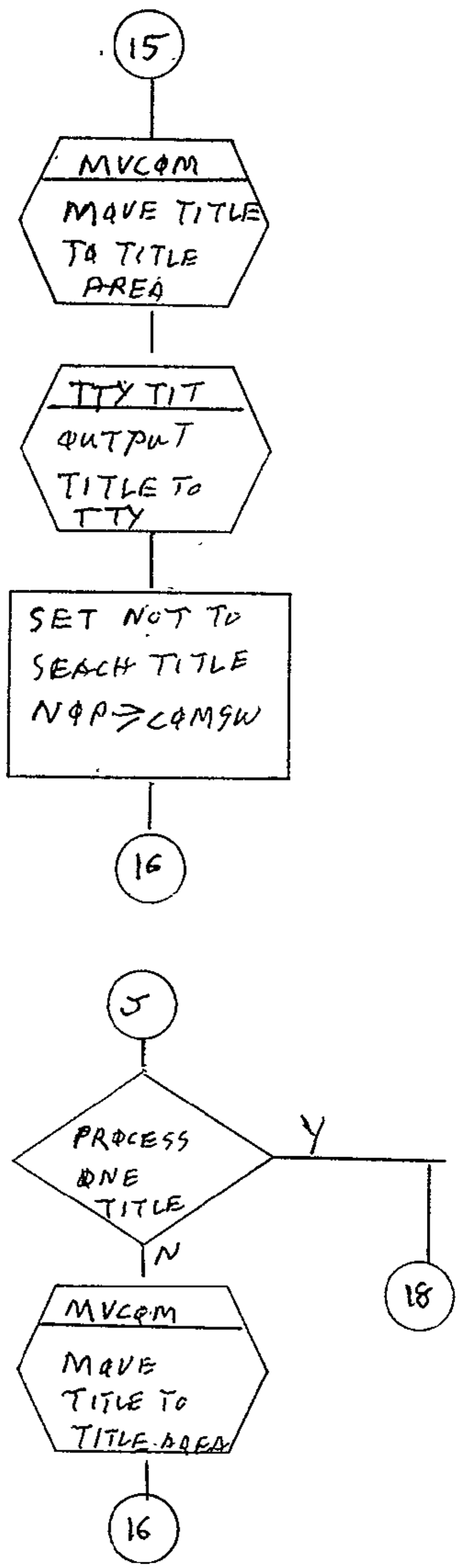

10
CHRGET
GET 2ND CHARACTER ΦF RECORD
(T) TITLE
Y
N
14
(S) SEPARATOR
Y
N
12
I ROTATE
Y
N
I
MΦVE 14 CHARACTER ΦF FΦRM RECΦRD
11

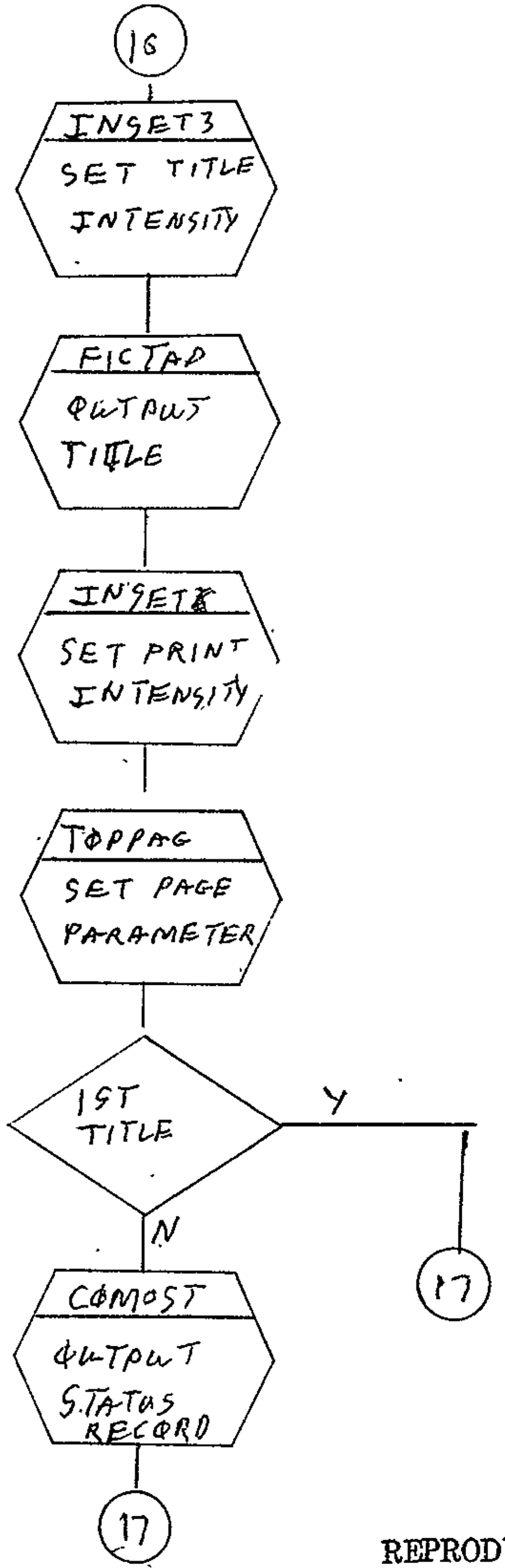

11
FICTAB
SET INDEX PARAMETER
I
RECGET
GET NEXT LOG RECORD
H


12
MVCOM
MOVE SEP RECORD TO TITLE AREA
MOVE 'TAPE ID' TO SEP RECORD END IN TITLE AREA
SAVE ADDRESS OF WHERE STORE TAPE NUMBER IN SEP FLD
STORE TAPE NUMBER IN TITLE AREA
STORE '$T' AT END OF TAPE NUMBER
13

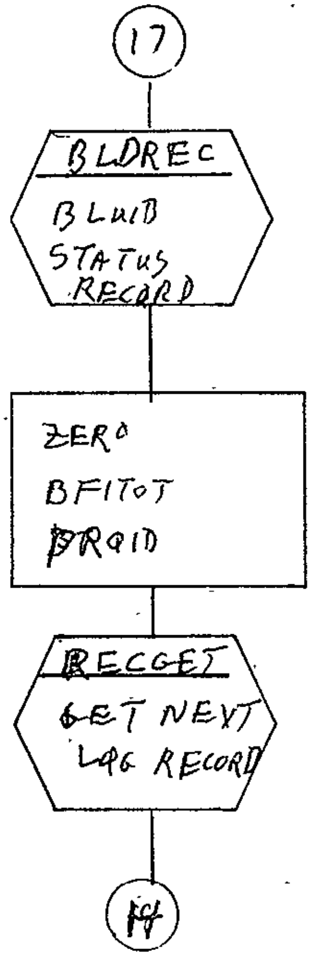

13
INSET3
SET INTENSITY TO TITLE INTENSITY
FICTAP
OUTPUT SEPARATOR TO FICHE
INSET6
SET INTENSITY TO PRINT INTENSITY
RECGET
GET NEXT LOG RECORD
H

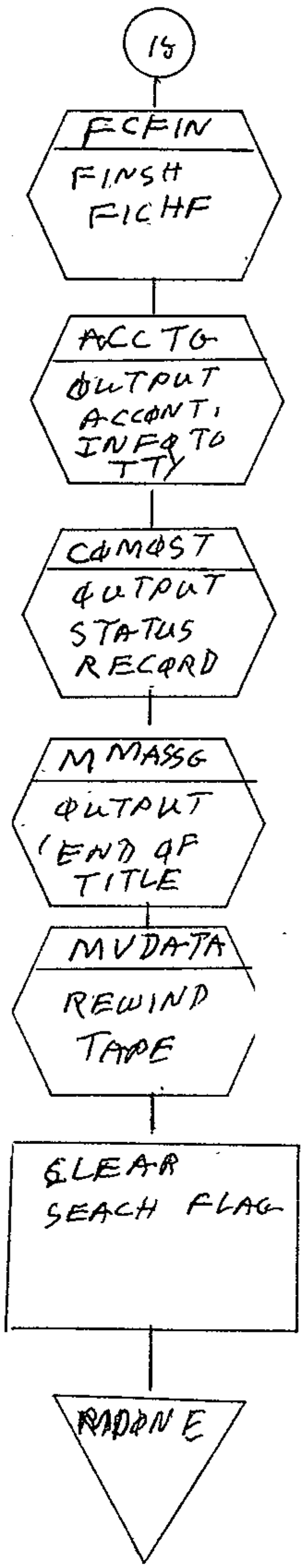

14
ADD 1
TO FICHE
START COUNT
BSTNQ
SEACH.
TITLE
N
Y
J
TITLE
NUMBER
REQ
Y
N
15
RECGET
GET NEXT
LEG RECORD
H

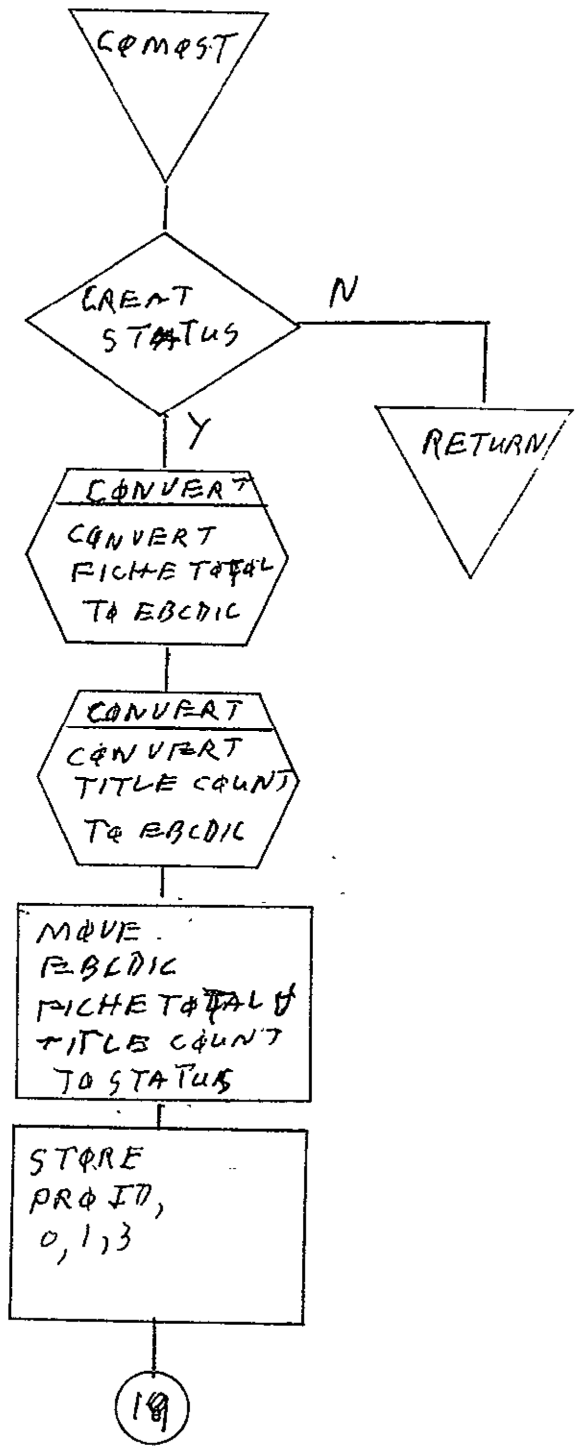

15
MVCOM
MOVE TITLE TO TITLE AREA
TTYTIT
OUTPUT TITLE TO TTY
SET NOT TO SEACH TITLE
NOP ⇒ COMSW
16
J
PROCESS ONE TITLE
Y
N
18
MVCOM
MOVE TITLE TO TITLE AREA
16



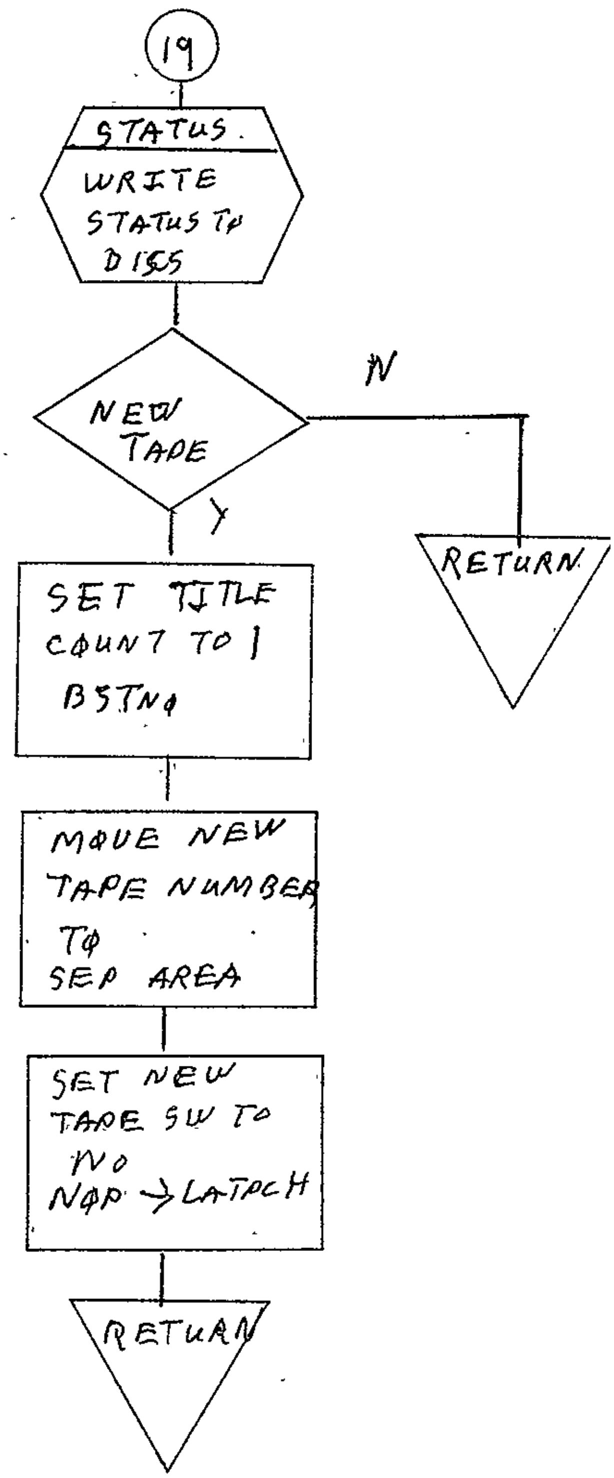
REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR

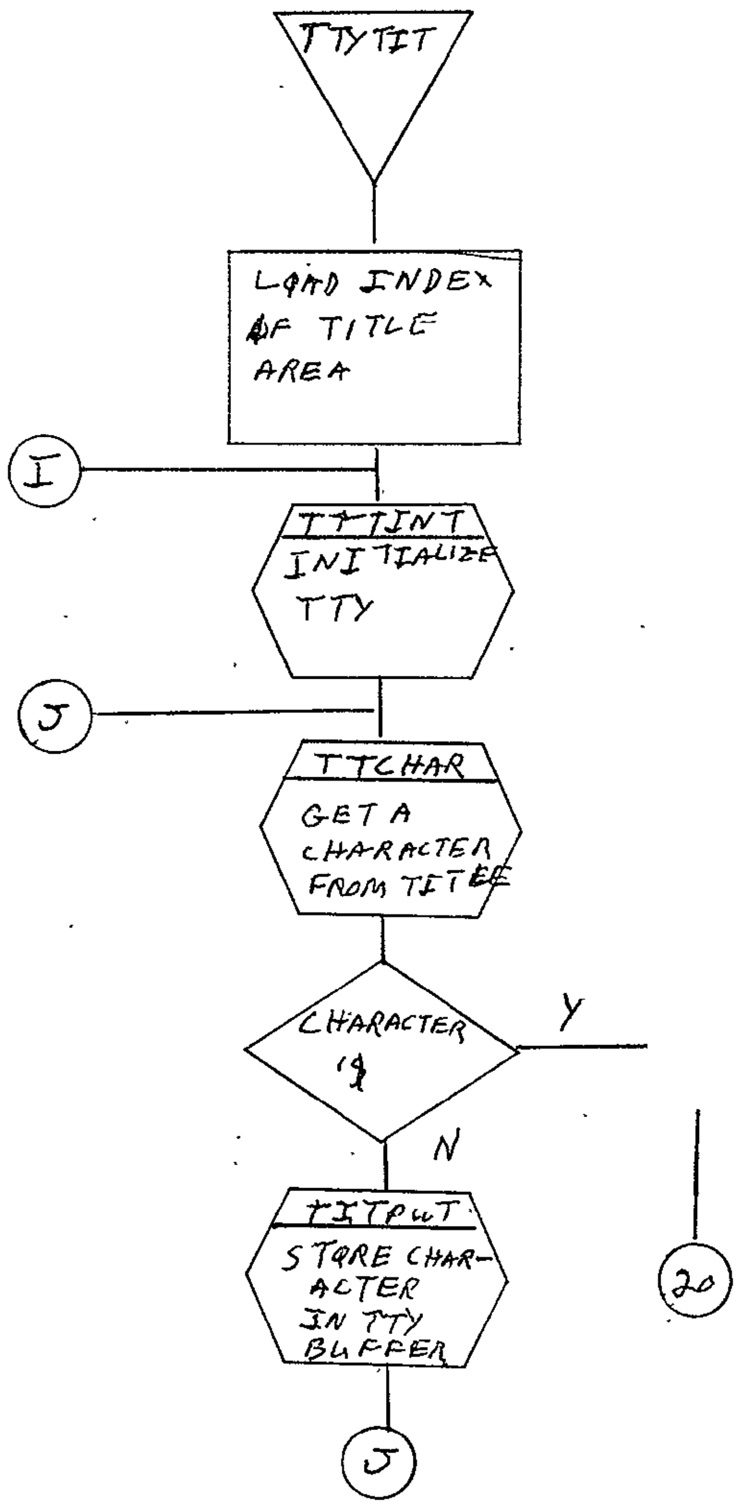

17
BLDREC
BLUID STATUS RECORD
ZERO
BFITOT
BRQID
RECGET
GET NEXT LOG RECORD
14

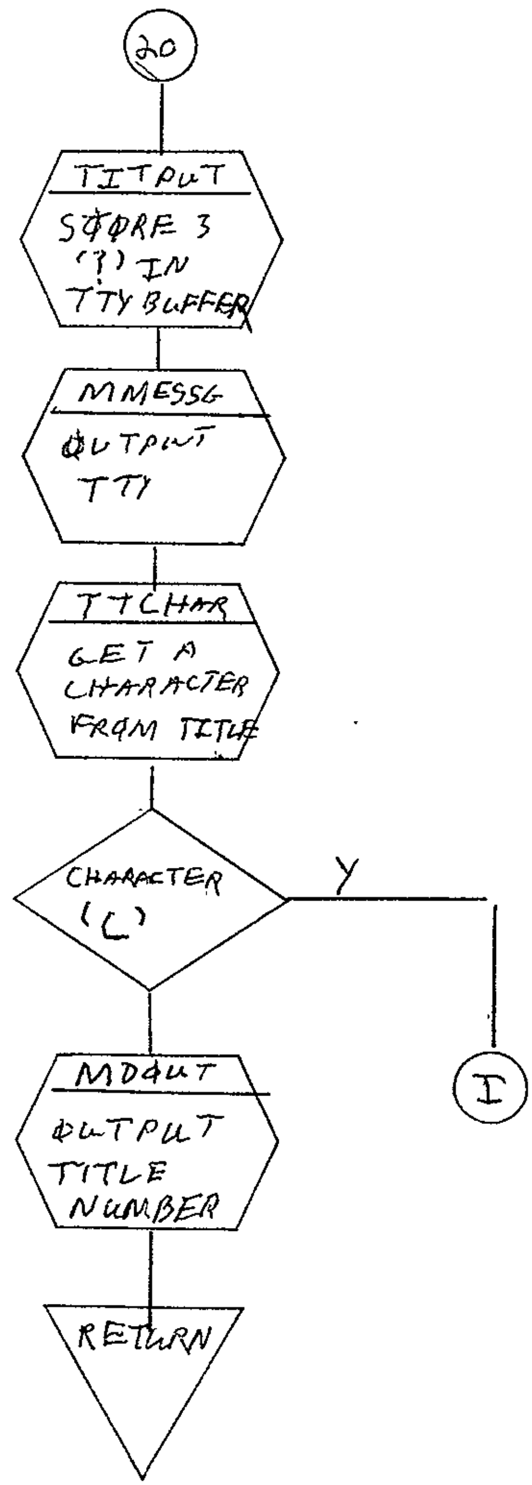

18
FCFIN
FINSH
FICHF
ACCTO
OUTPUT
ACCONT.
INFO TO
TTY
COMOST
OUTPUT
STATUS
RECORD
MMASSG
OUTPUT
'END OF
TITLE
MVDATA
REWIND
TAPE
CLEAR
SEACH FLAG
RADONE

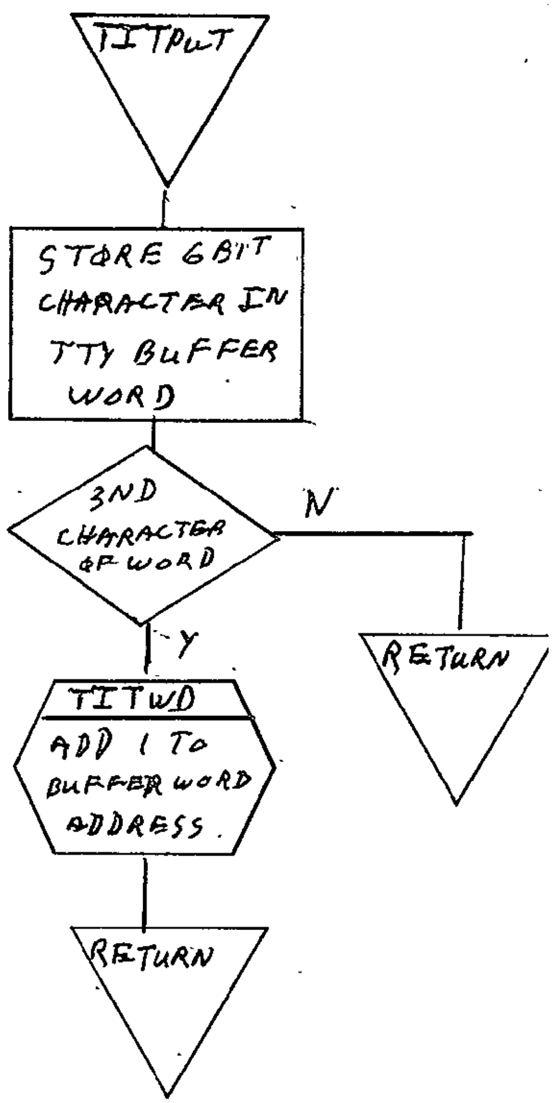


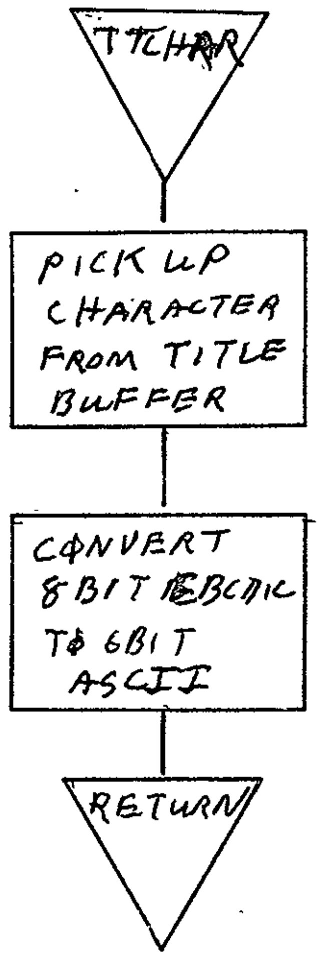
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

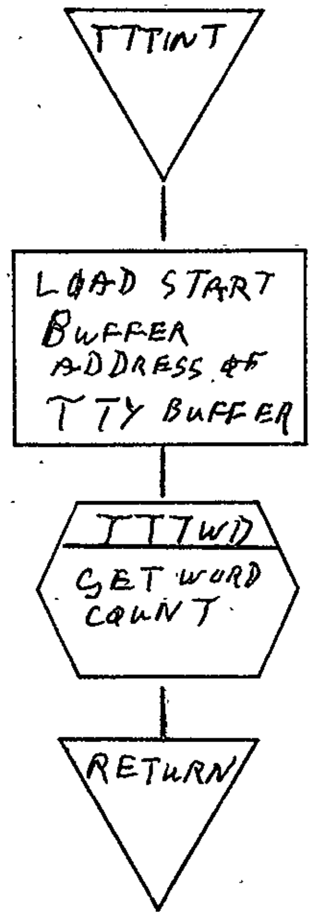

19
STATUS
WRITE STATUS TO DISCS
NEW TAPE
N
Y
RETURN
SET TITLE COUNT TO 1
BSTNO
MOVE NEW TAPE NUMBER TO
SEP AREA
SET NEW TAPE SW TO NO
NOP → LATCH
RETURN

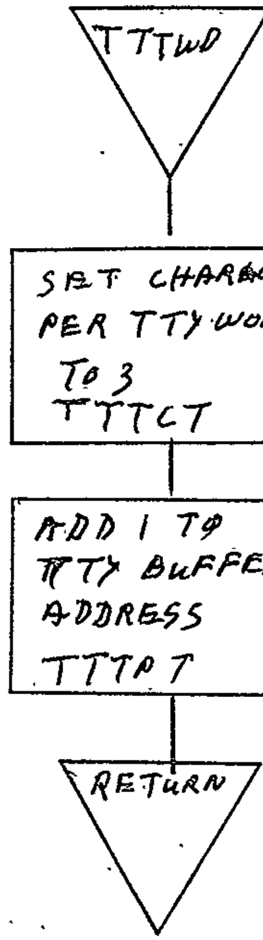

TTYTIT
LOAD INDEX OF TITLE AREA
I
TTTINT
INITIALIZE TTY
J
TTCHAR
GET A CHARACTER FROM TITLE
CHARACTER
Y
N
TITPUT
STORE CHARACTER IN TTY BUFFER
20
J

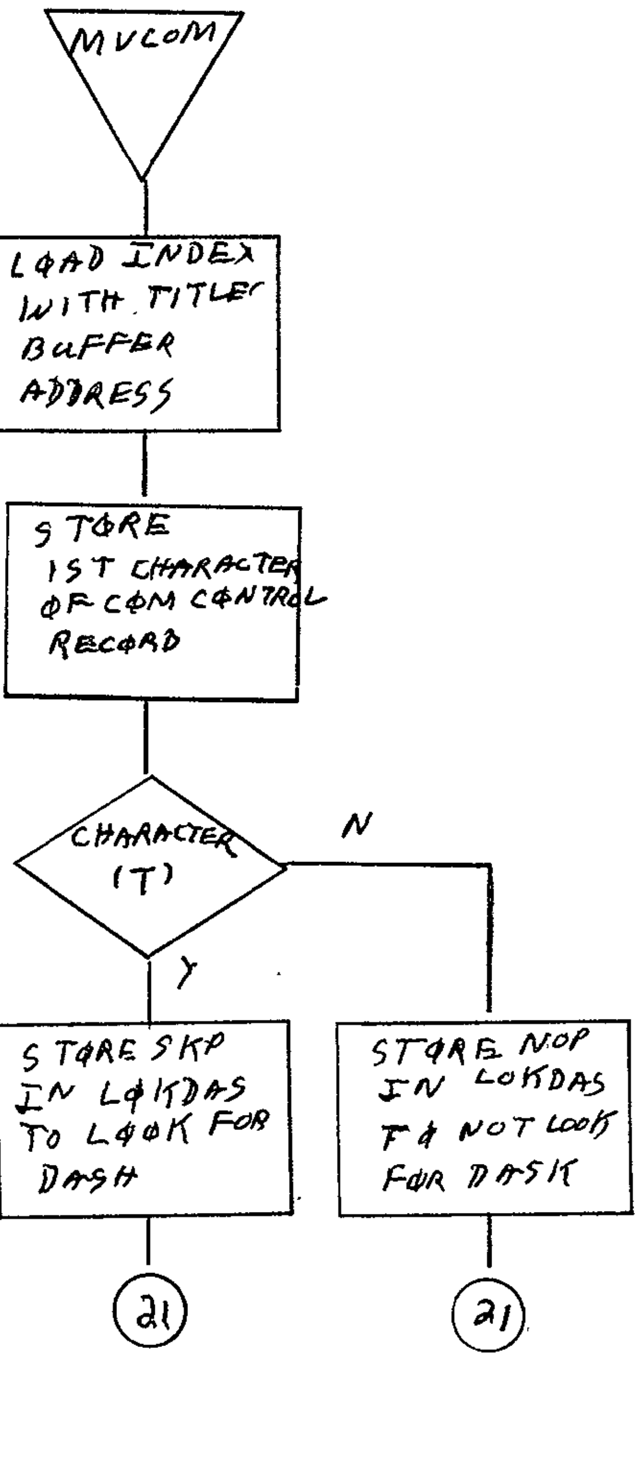

20
TITPUT
STORE 3 (?) IN TTY BUFFER
MMESSG
OUTPUT TTY
TTCHAR
GET A CHARACTER FROM TITLE
CHARACTER (L)
Y
I
MDOUT
OUTPUT TITLE NUMBER
RETURN

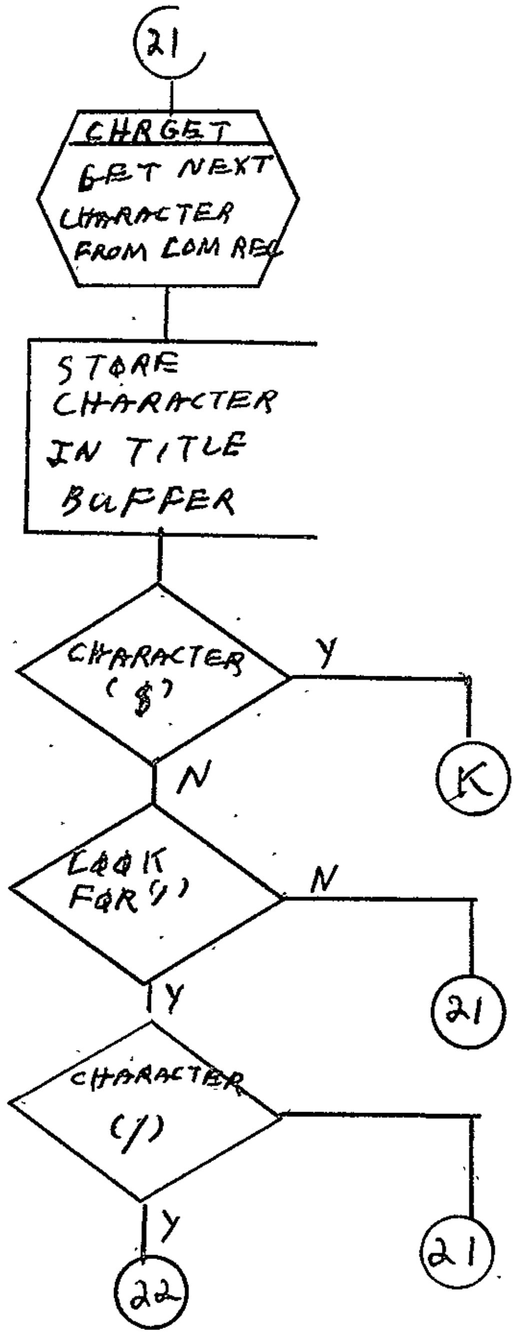

TITPUT
STORE 6BIT CHARACTER IN TTY BUFFER WORD
3ND CHARACTER OF WORD
N
Y
RETURN
TITWD
ADD 1 TO BUFFER WORD ADDRESS.
RETURN

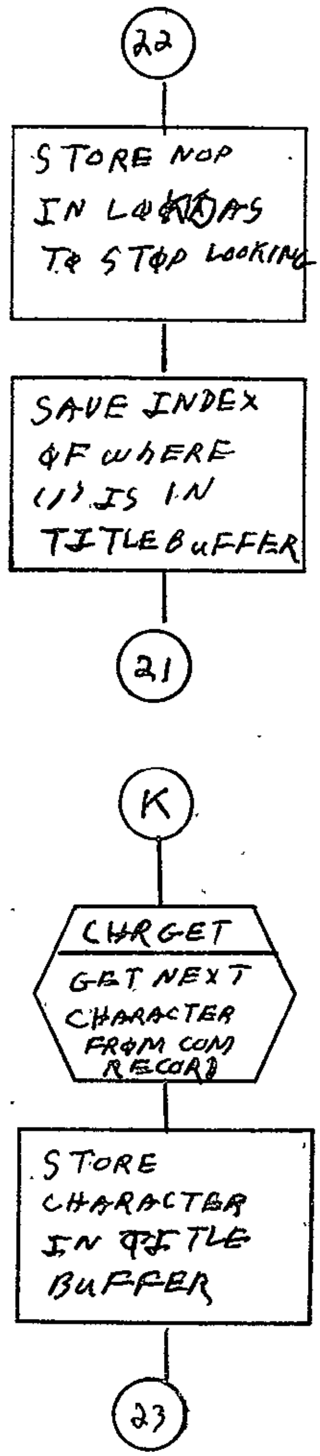

TTCHAR
PICK UP CHARACTER FROM TITLE BUFFER
CONVERT 8BIT EBCDIC TO 6BIT ASCII
RETURN

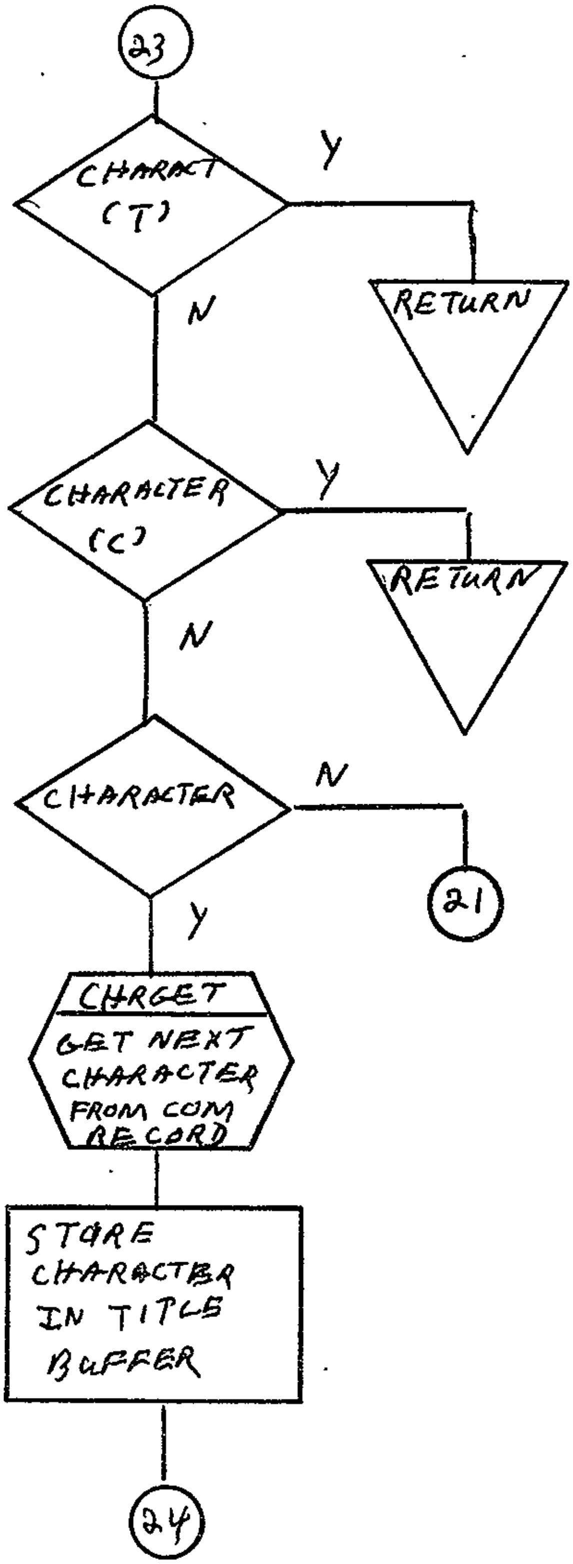

TTTINT
LOAD START BUFFER ADDRESS OF TTY BUFFER
TTTWD
GET WORD COUNT
RETURN

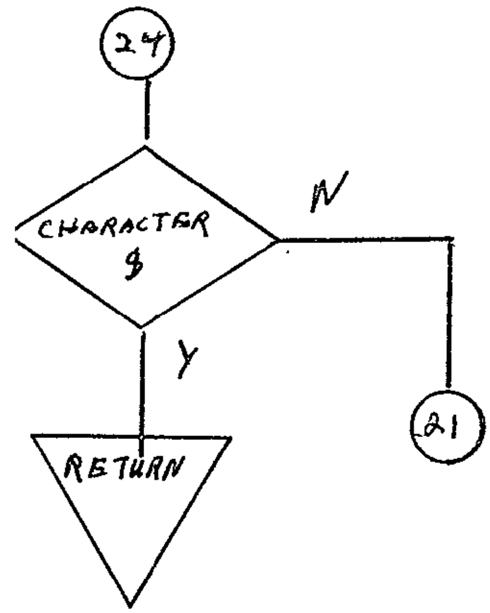

TTTWD
SET CHARACTER
PER TTY WORD
TO 3
TTTCT
ADD 1 TO
TTY BUFFER
ADDRESS
TTTPT
RETURN

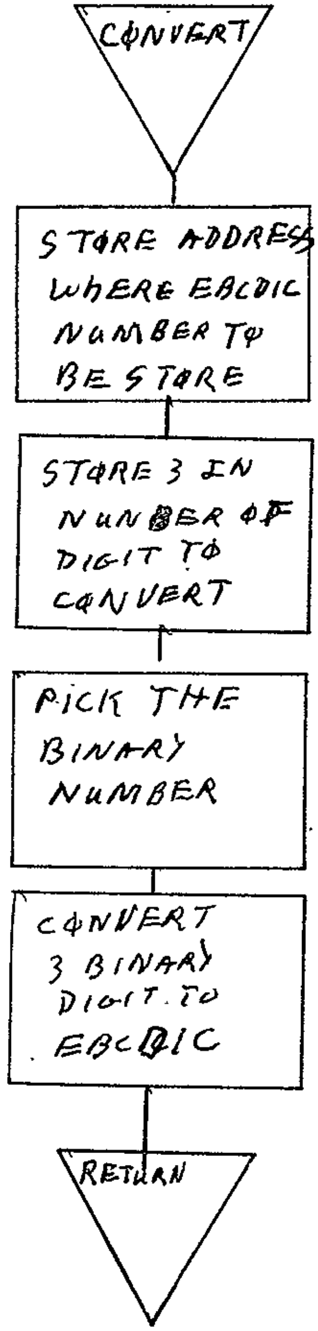

MVCOM
LOAD INDEX WITH TITLE BUFFER ADDRESS
STORE 1ST CHARACTER OF COM CONTROL RECORD
CHARACTER (T)
N
Y
STORE SKP IN LOKDAS TO LOOK FOR DASH
STORE NOP IN LOKDAS TO NOT LOOK FOR DASH
21
21

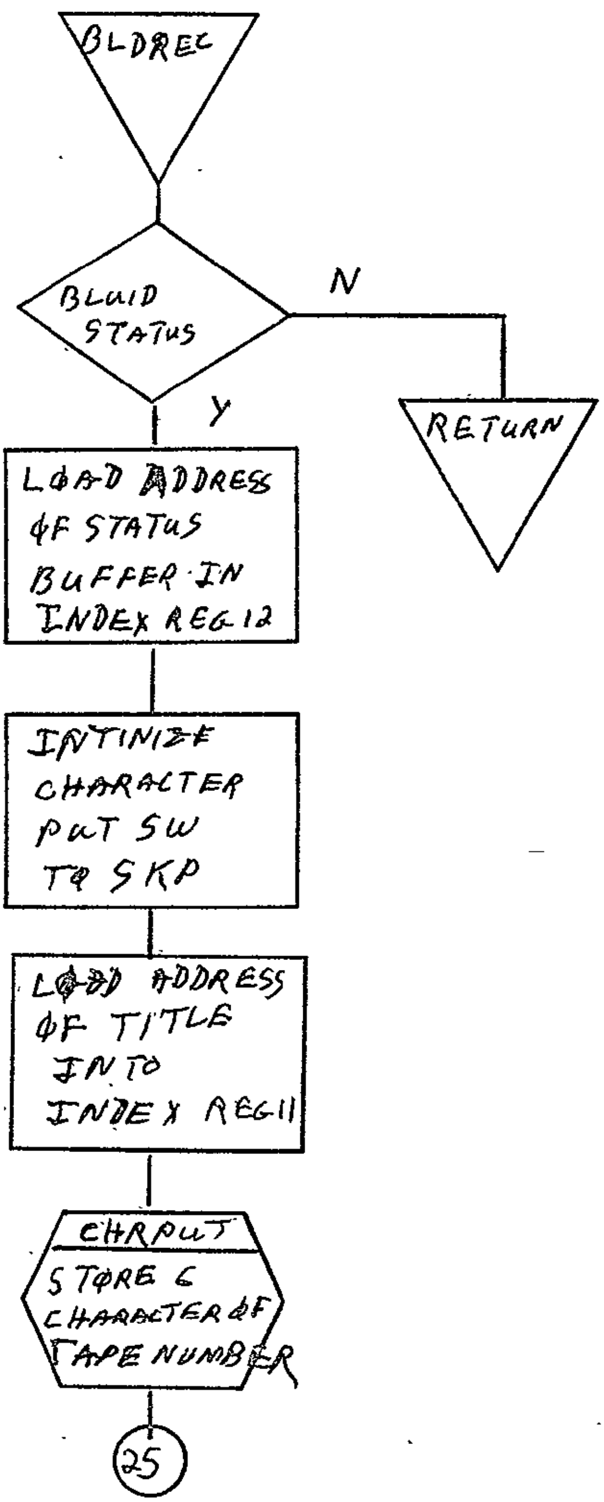

21
CHRGET
GET NEXT CHARACTER FROM COM REC
STORE CHARACTER IN TITLE BUFFER
CHARACTER ($)
Y
K
N
LOOK FOR (/)
N
21
Y
CHARACTER (/)
21
Y
22

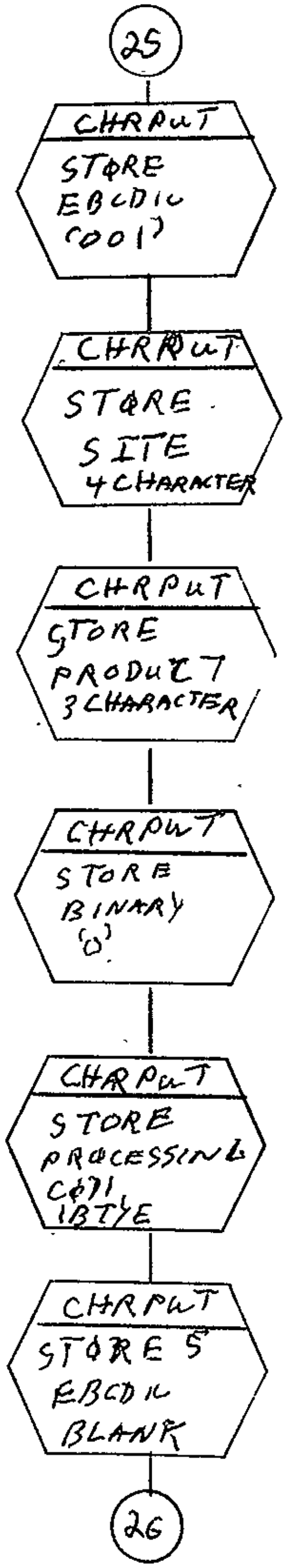

22
STORE NOP
IN LOOKAS
TO STOP LOOKING
SAVE INDEX
OF WHERE
(/) IS IN
TITLEBUFFER
21
K
CHRGET
GET NEXT
CHARACTER
FROM COM
RECORD
STORE
CHARACTER
IN TITLE
BUFFER
23

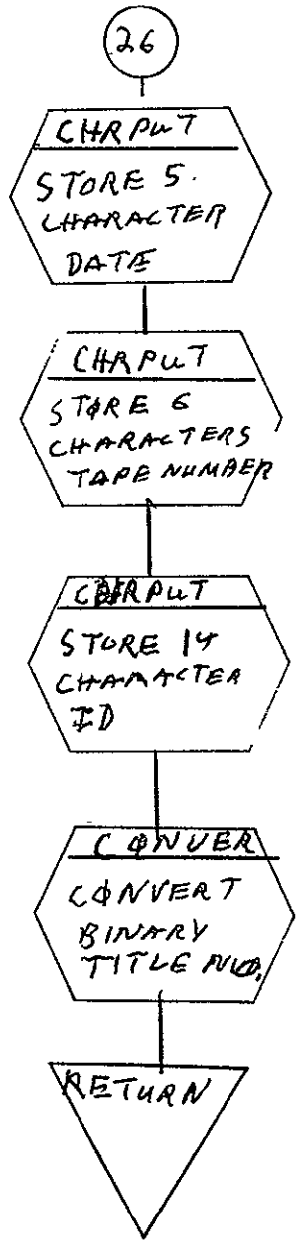

23
CHARACT (T)
Y
RETURN
N
CHARACTER (C)
Y
RETURN
N
CHARACTER
N
21
Y
CHRGET
GET NEXT CHARACTER FROM COM RECORD
STORE CHARACTER IN TITLE BUFFER
24

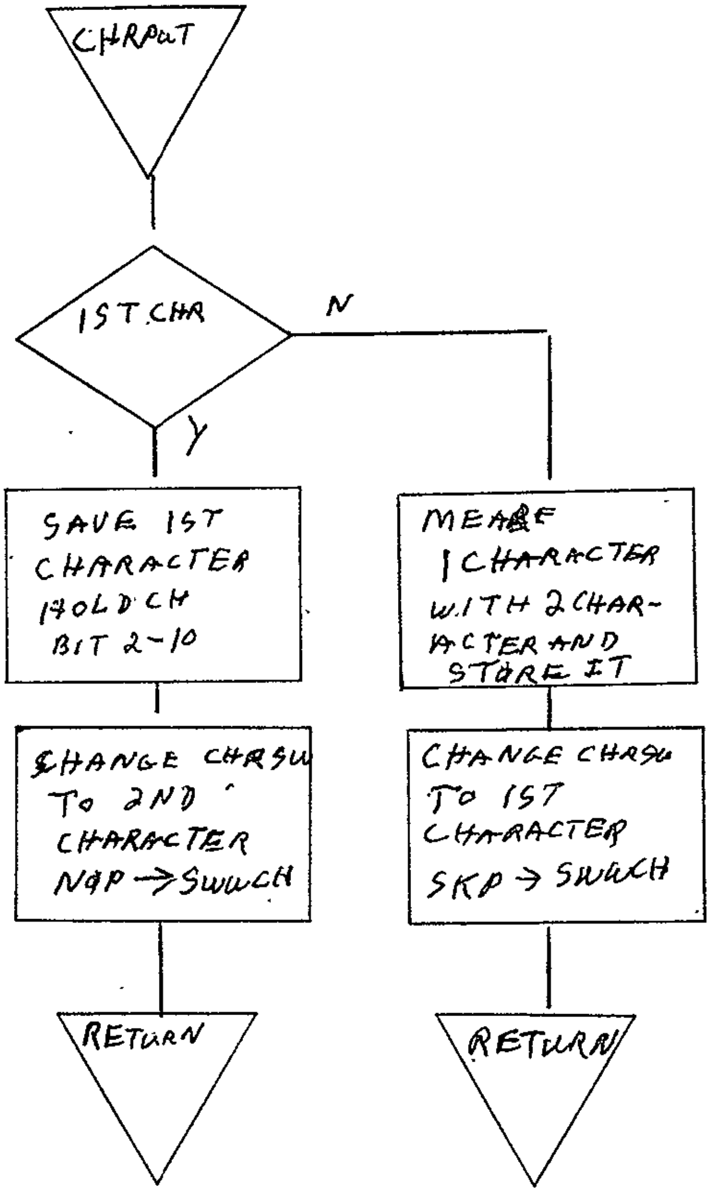

24
CHARACTER
$
N
Y
RETURN
21

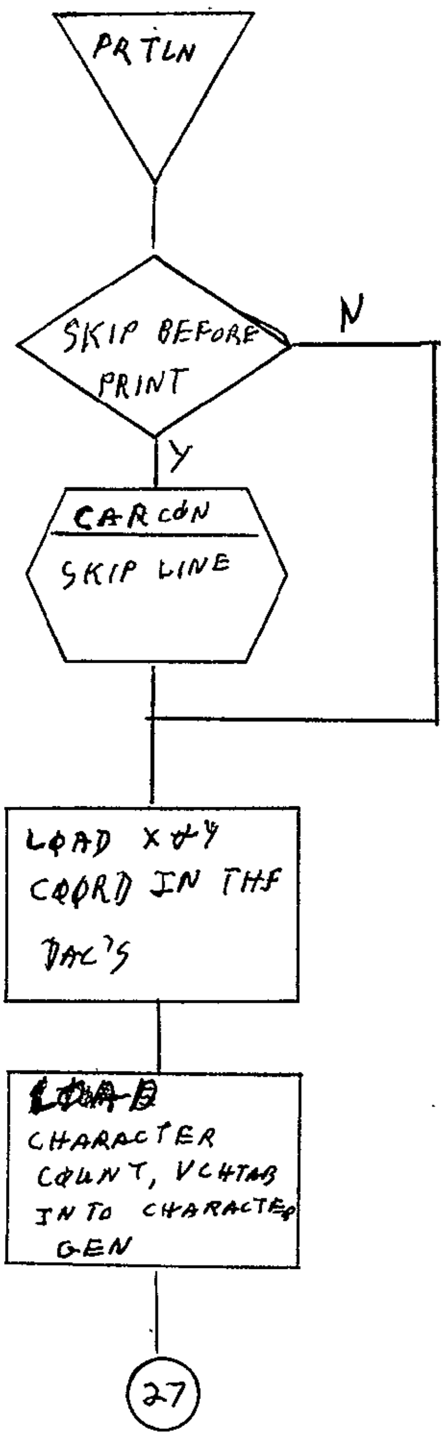

CONVERT
STORE ADDRESS WHERE EBCDIC NUMBER TO BE STORE
STORE 3 IN NUMBER OF DIGIT TO CONVERT
PICK THE BINARY NUMBER
CONVERT 3 BINARY DIGIT TO EBCDIC
RETURN

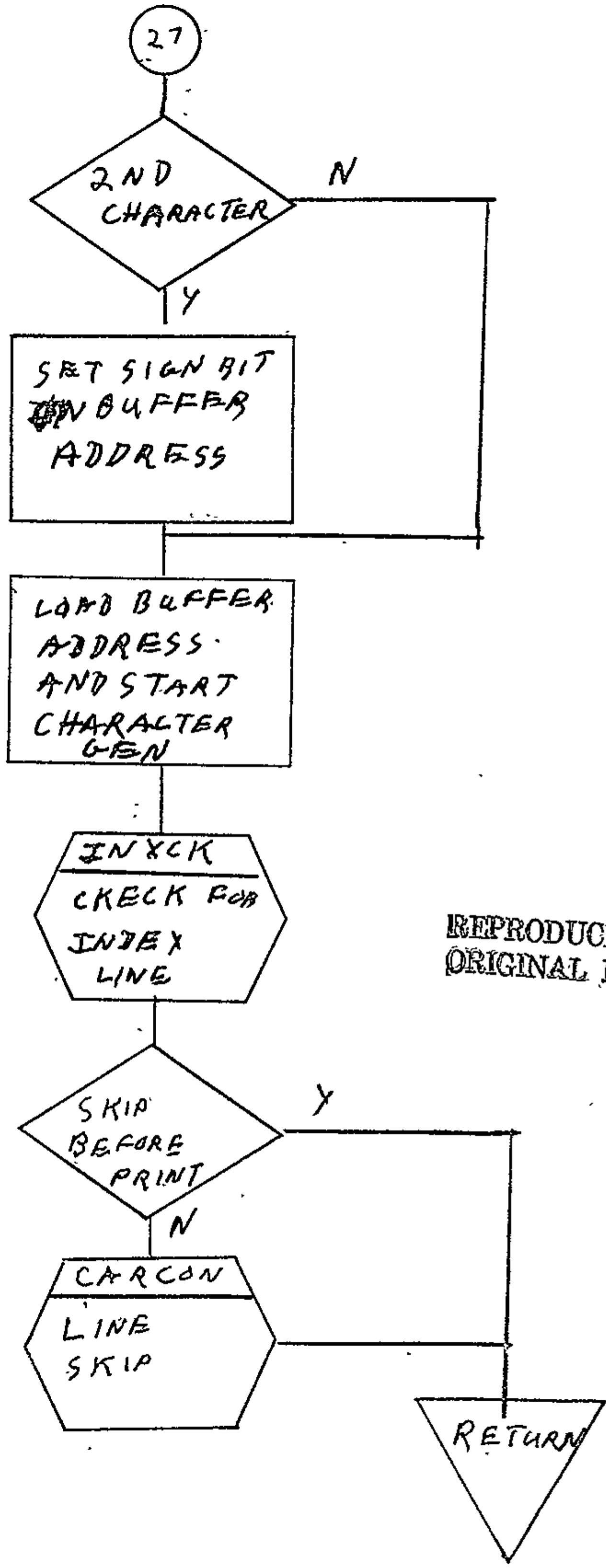

BLDREC
BLUID STATUS
N
RETURN
Y
LOAD ADDRESS OF STATUS BUFFER IN INDEX REG 12
INTINIZE CHARACTER PUT SW TO SKP
LOAD ADDRESS OF TITLE INTO INDEX REG 11
CHRPUT
STORE 6 CHARACTER OF TAPE NUMBER
25

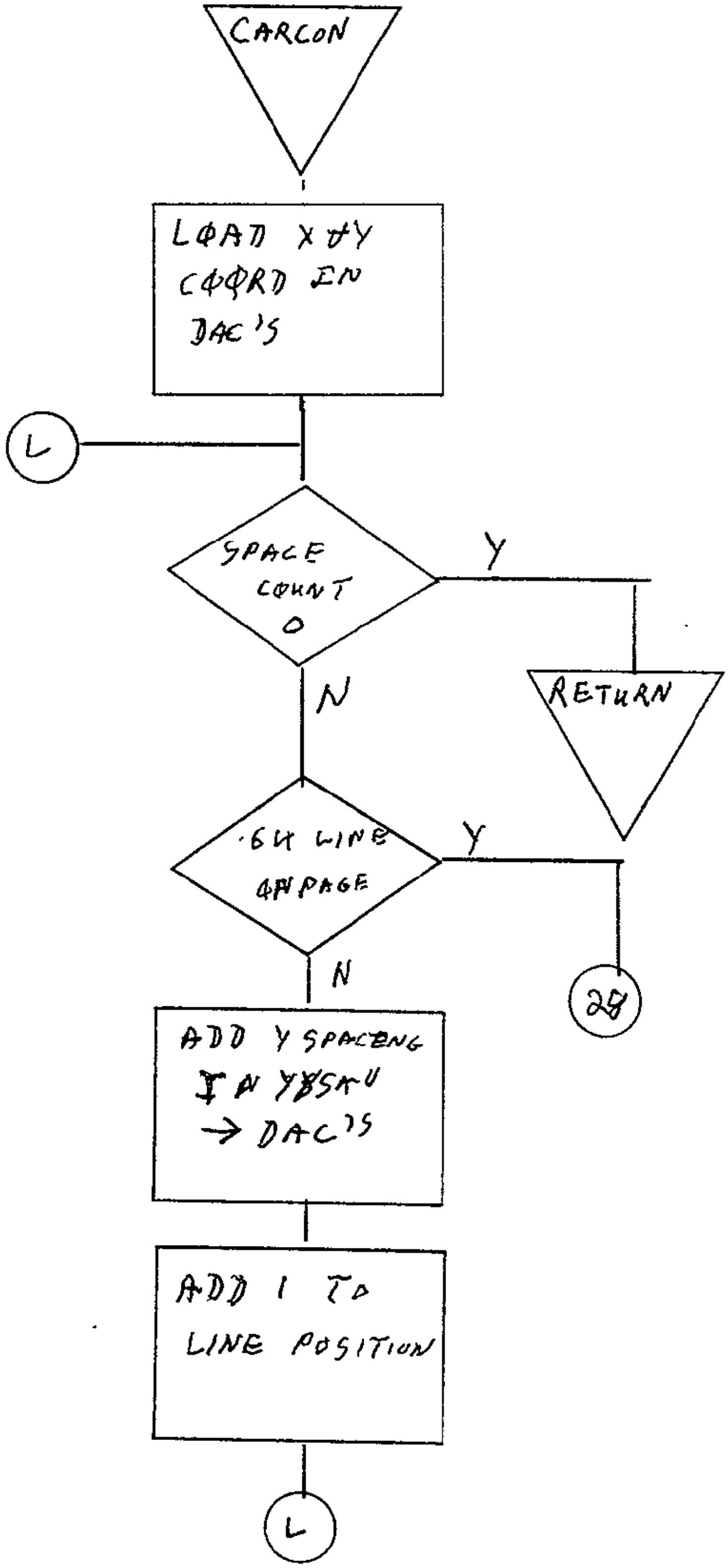

25
CHRPUT
STORE
EBCDIC
(001)
CHRPUT
STORE
SITE
4 CHARACTER
CHRPUT
STORE
PRODUCT
3 CHARACTER
CHRPUT
STORE
BINARY
(0)
CHRPUT
STORE
PROCESSING
C071
1 BTYE
CHRPUT
STORE 5
EBCDIC
BLANK
26

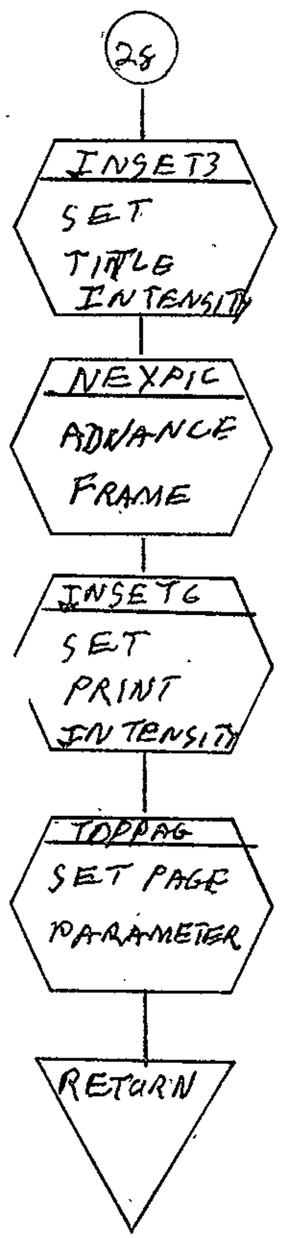

26
CHRPUT
STORE 5.
CHARACTER
DATE
CHRPUT
STORE 6
CHARACTERS
TAPE NUMBER
CHRPUT
STORE 14
CHARACTER
ID
CONVER
CONVERT
BINARY
TITLE NO.
RETURN

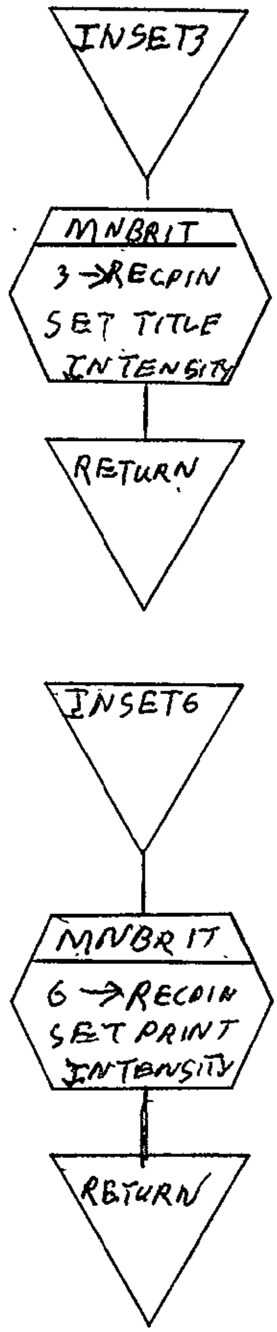

CHRPUT
1ST CHR
N
Y
SAVE 1ST CHARACTER HOLDCH BIT 2-10
MERGE 1 CHARACTER WITH 2 CHARACTER AND STORE IT
CHANGE CHRSW TO 2ND CHARACTER NOP → SWUCH
CHANGE CHRSW TO 1ST CHARACTER SKP → SWUCH
RETURN
RETURN

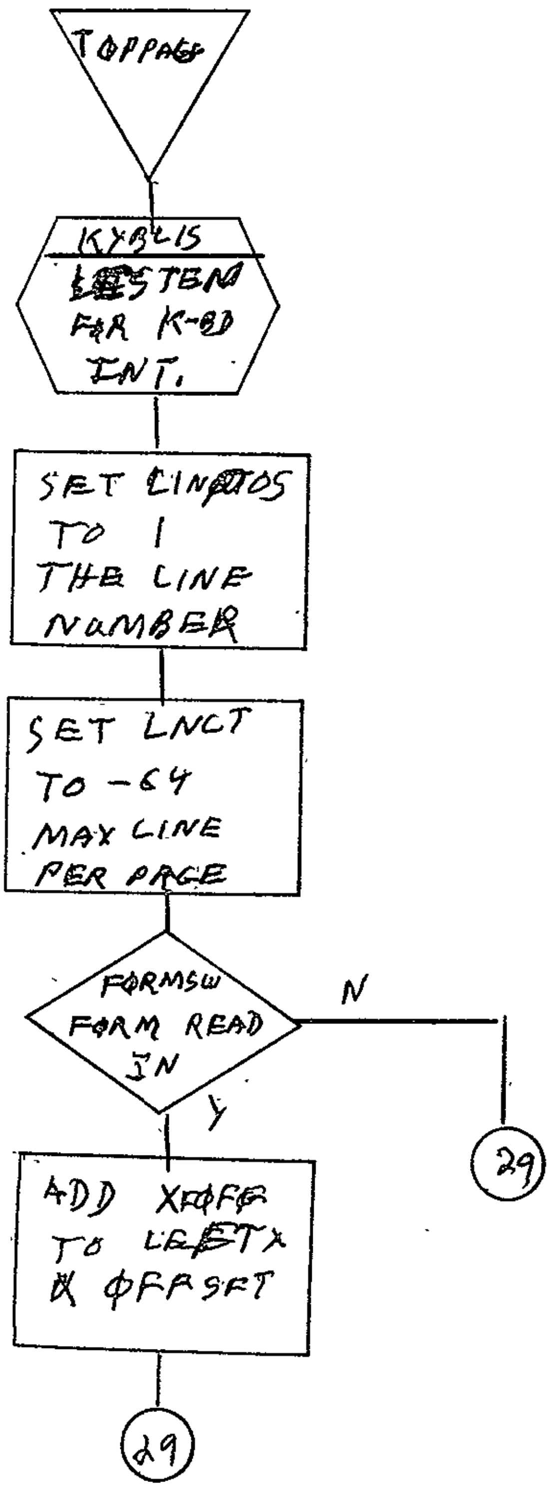

PRTLN
SKIP BEFORE PRINT
N
Y
CARCON
SKIP LINE
LOAD X & Y COORD IN THE DAC'S
~~LOAD~~ CHARACTER COUNT, VCHTAB INTO CHARACTER GEN
27

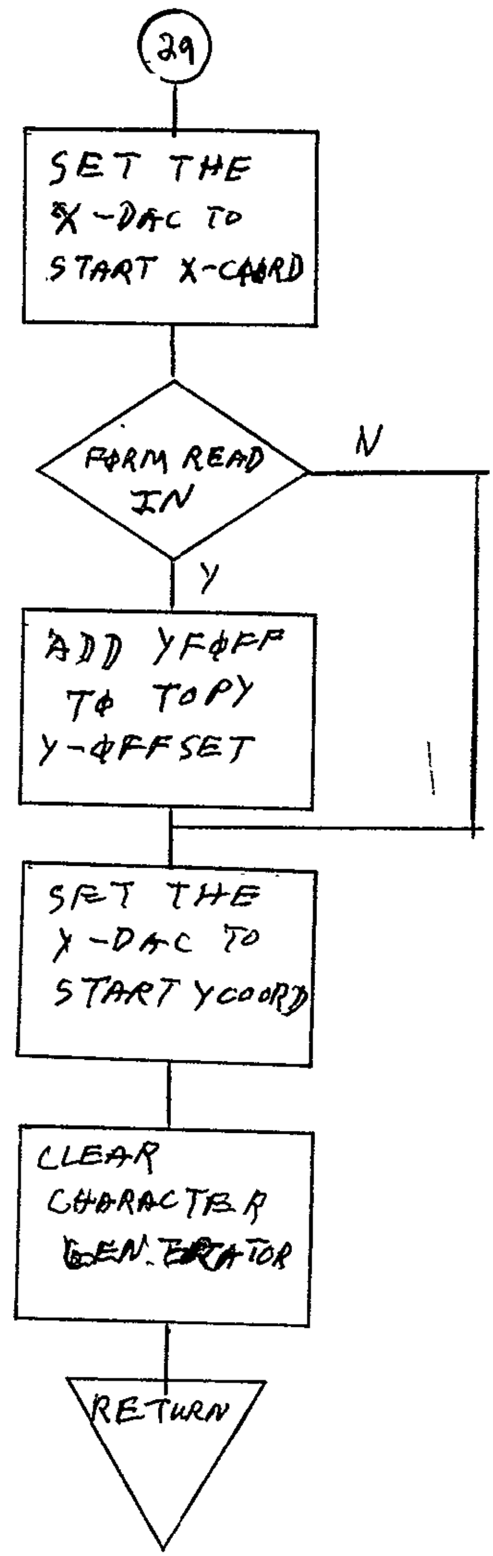

27
2ND CHARACTER
N
Y
SET SIGN BIT ON BUFFER ADDRESS
LOAD BUFFER ADDRESS AND START CHARACTER GEN
INXCK
CKECK FOR INDEX LINE
SKIP BEFORE PRINT
Y
N
CARCON
LINE SKIP
RETURN

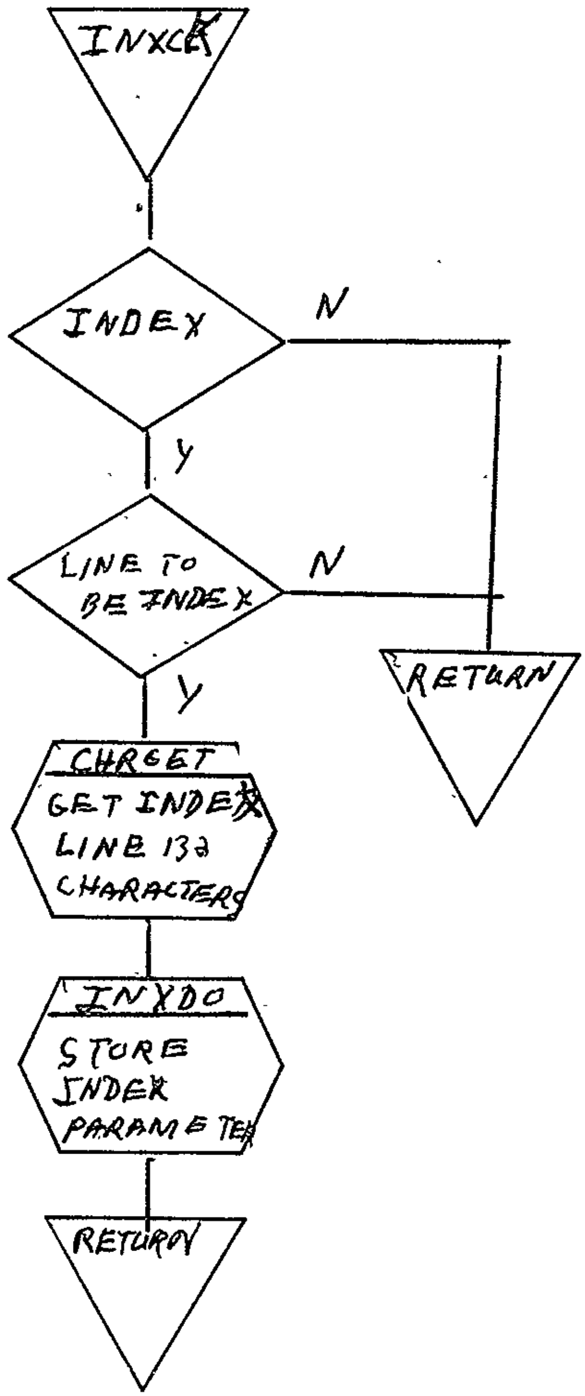

CARCON
LOAD X & Y COORD IN DAC'S
L
SPACE COUNT 0
Y
RETURN
N
64 LINE ON PAGE
Y
28
N
ADD Y SPACING IN YBSAV → DAC'S
ADD 1 TO LINE POSITION
L

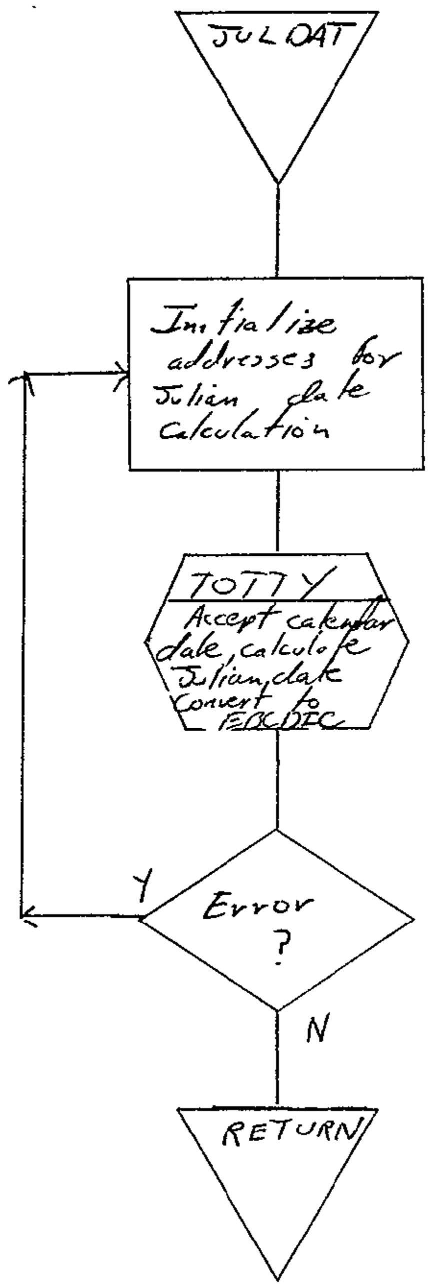

28
INSET3
SET
TITLE
INTENSITY
NEXPIC
ADVANCE
FRAME
INSET6
SET
PRINT
INTENSITY
TOPPAG
SET PAGE
PARAMETER
RETURN

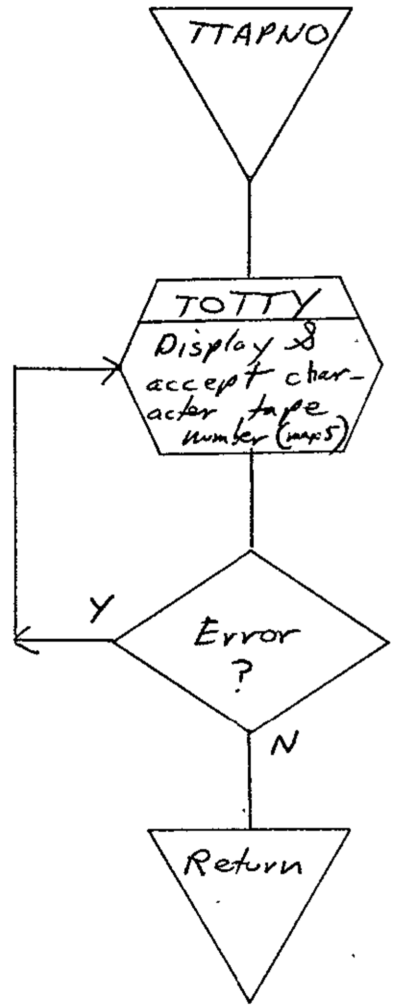

INSET3
MNBRIT
3 → RECPIN
SET TITLE
INTENSITY
RETURN
INSET6
MNBRIT
6 → RECPIN
SET PRINT
INTENSITY
RETURN

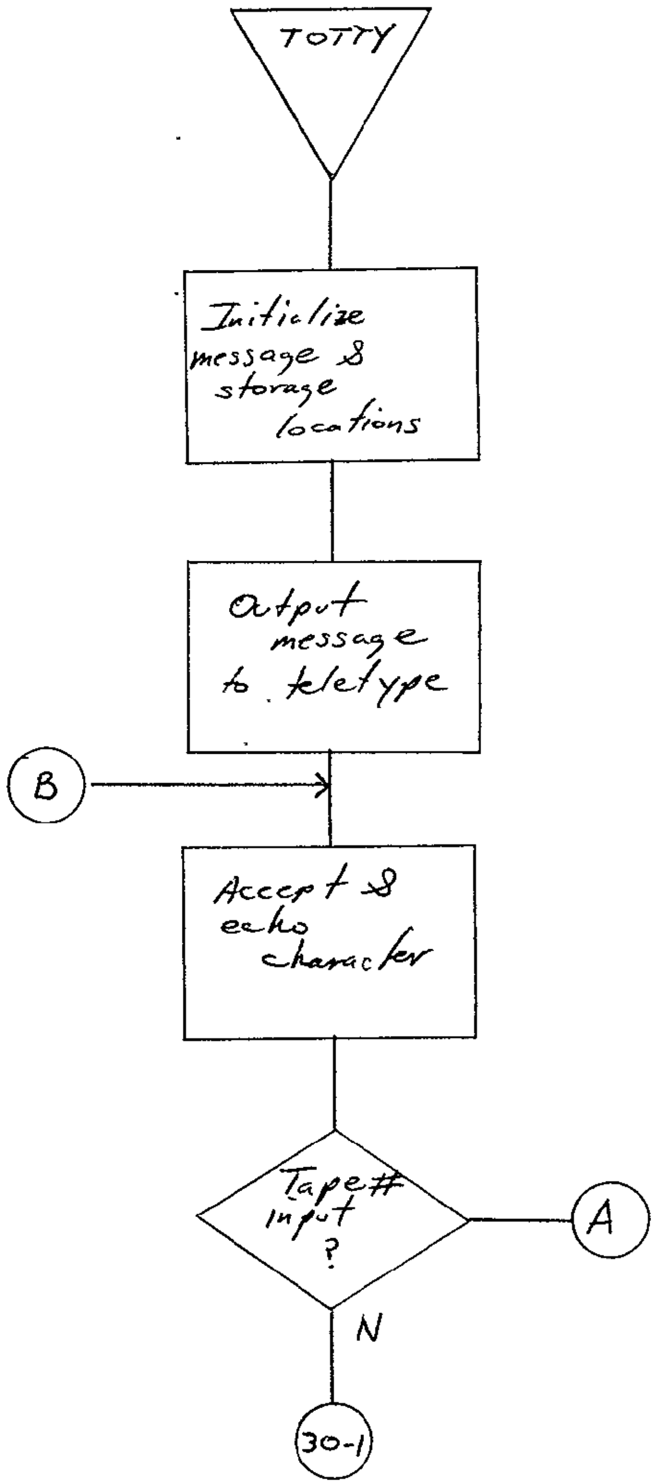

TOPPAGE
KYBLIS
LISTEN FOR K-BD INT.
SET LINPOS TO 1 THE LINE NUMBER
SET LNCT TO -64 MAX LINE PER PAGE
FORMSW FORM READ IN
N
Y
29
ADD XOFF TO LEFTX OFFSET
29

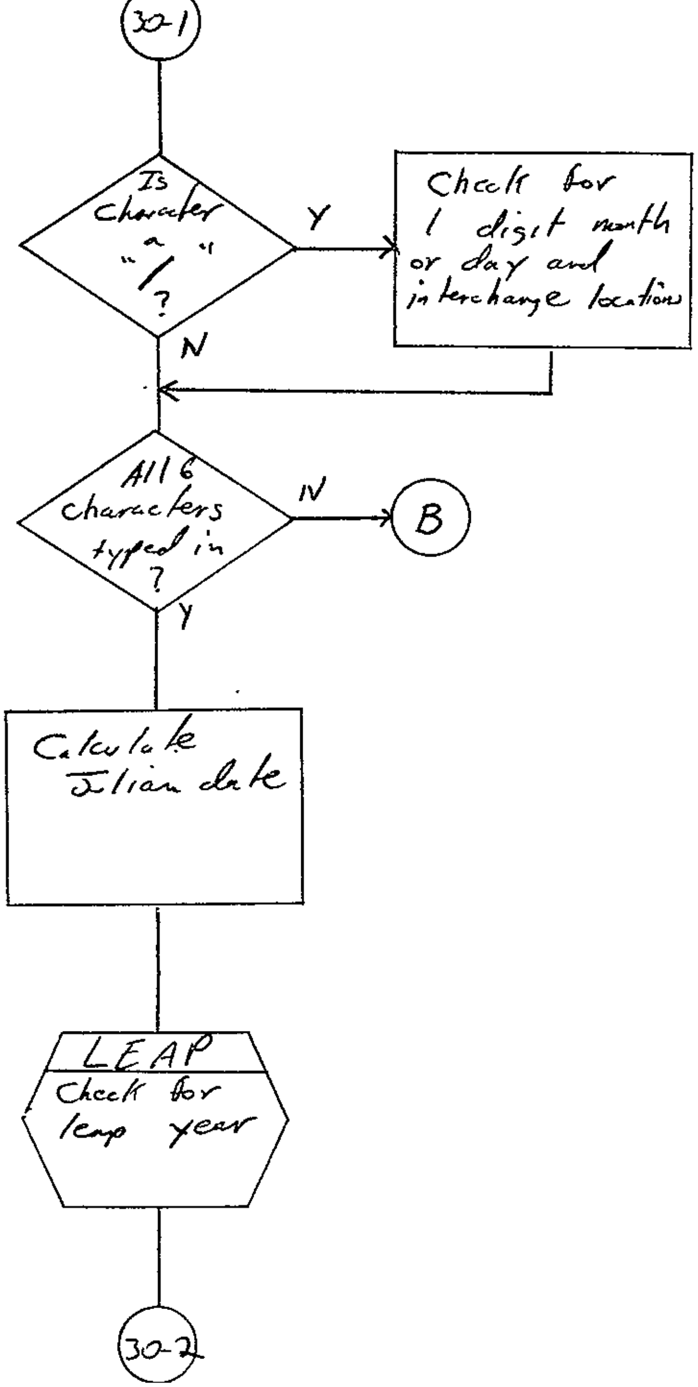

29
SET THE X-DAC TO START X-COORD
FORM READ IN
N
Y
ADD YFOFF TO TOPY Y-OFFSET
SET THE Y-DAC TO START YCOORD
CLEAR CHARACTER GENERATOR
RETURN

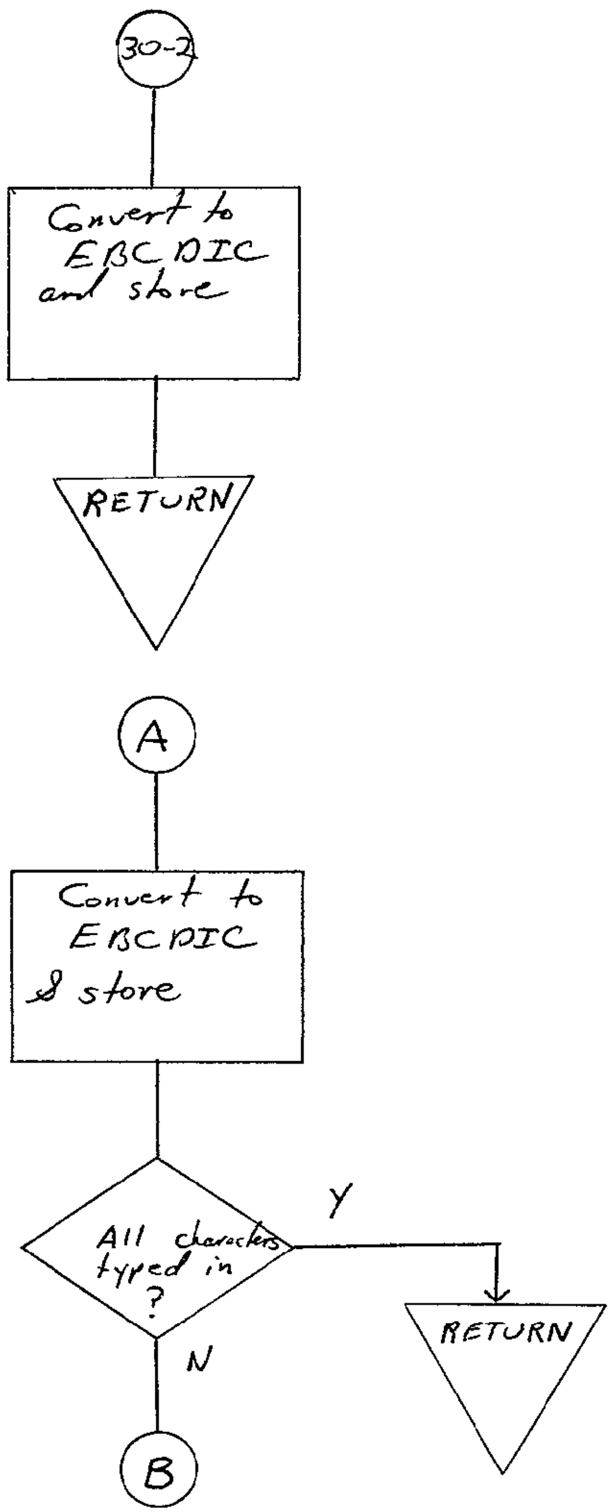

INXCK
INDEX
N
Y
LINE TO BE INDEX
N
RETURN
Y
CHRGET
GET INDEX LINE 132 CHARACTERS
INXDO
STORE INDEX PARAMETER
RETURN

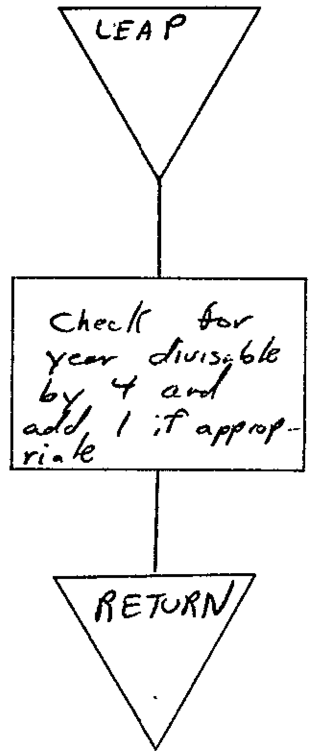

JULDAT
Initialize addresses for Julian date calculation
TOTTY
Accept calendar date, calculate Julian date Convert to EBCDIC
Error ?
Y
N
RETURN

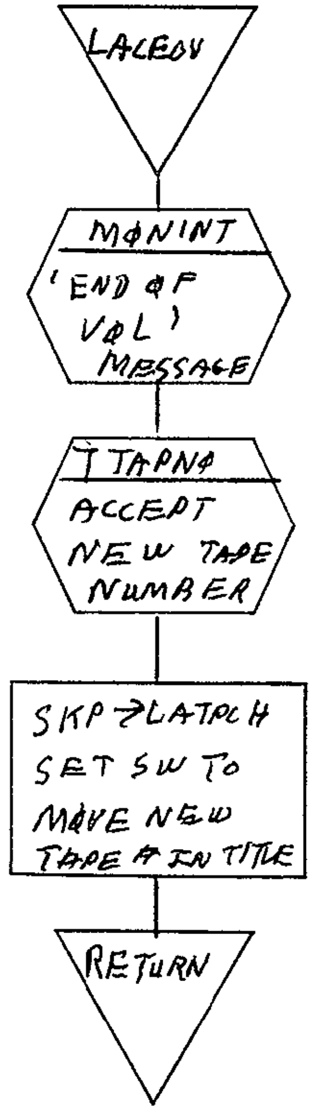

TTAPNO
TOTTY
Display & accept character tape number (max5)
Y
Error ?
N
Return

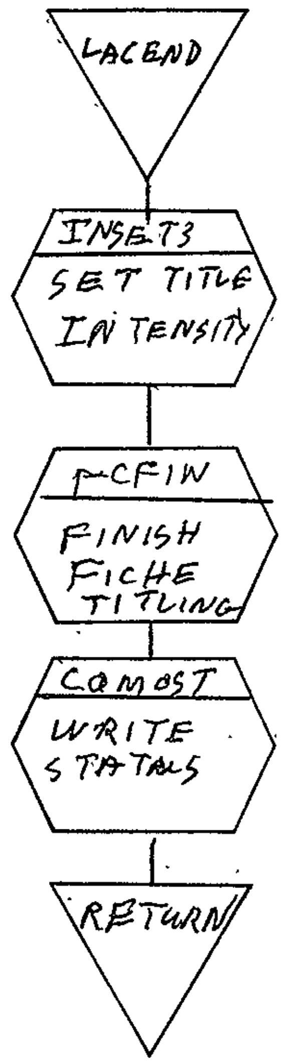

TOTTY
Initialize message & storage locations
Output message to teletype
B
Accept & echo character
Tape# input ?
A
N
30-1

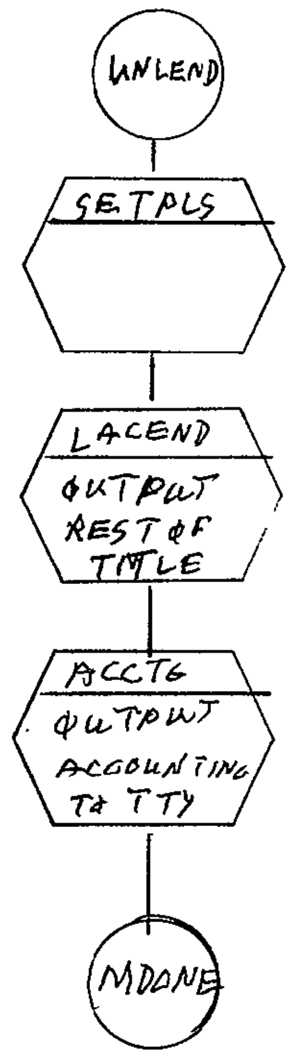

30-1
Is character a "/" ?
Y
Check for 1 digit month or day and interchange location
N
All 6 characters typed in ?
N
B
Y
Calculate Julian date
LEAP
Check for leap year
30-2

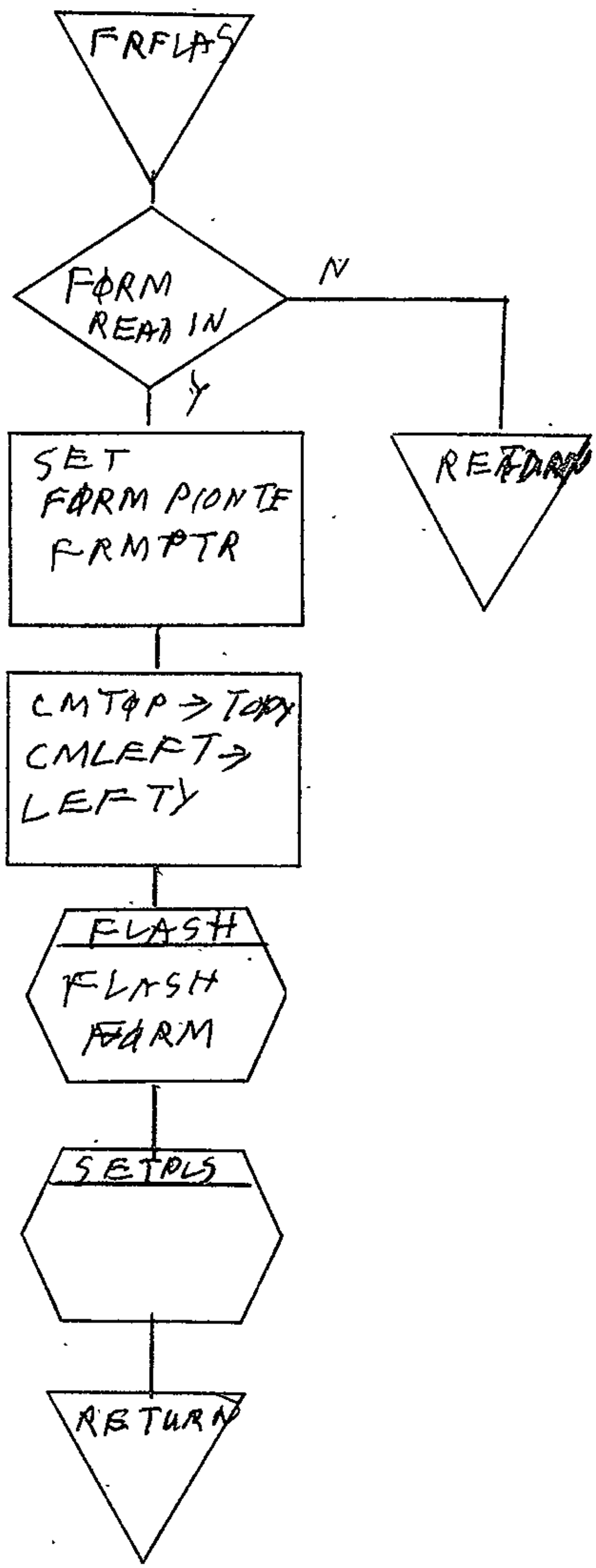

30-2
Convert to EBCDIC and store
RETURN
A
Convert to EBCDIC & store
All characters typed in ?
Y
N
RETURN
B

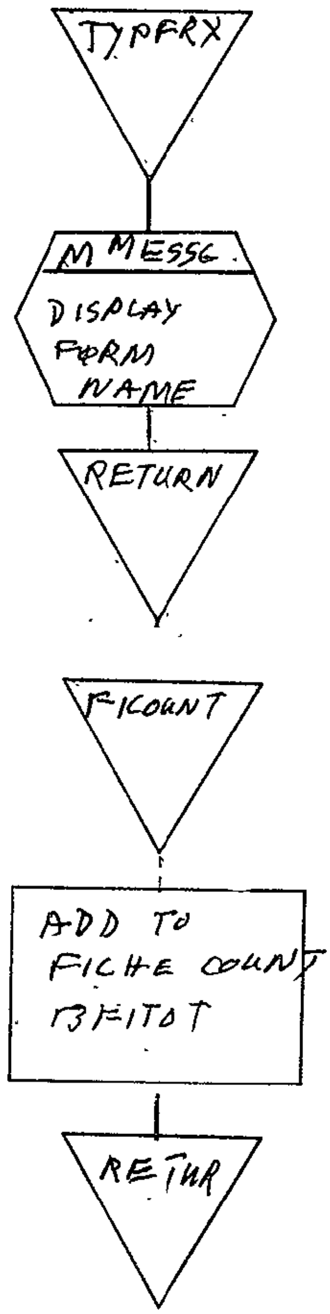

LEAP
Check for year divisable by 4 and add 1 if approp-riate
RETURN

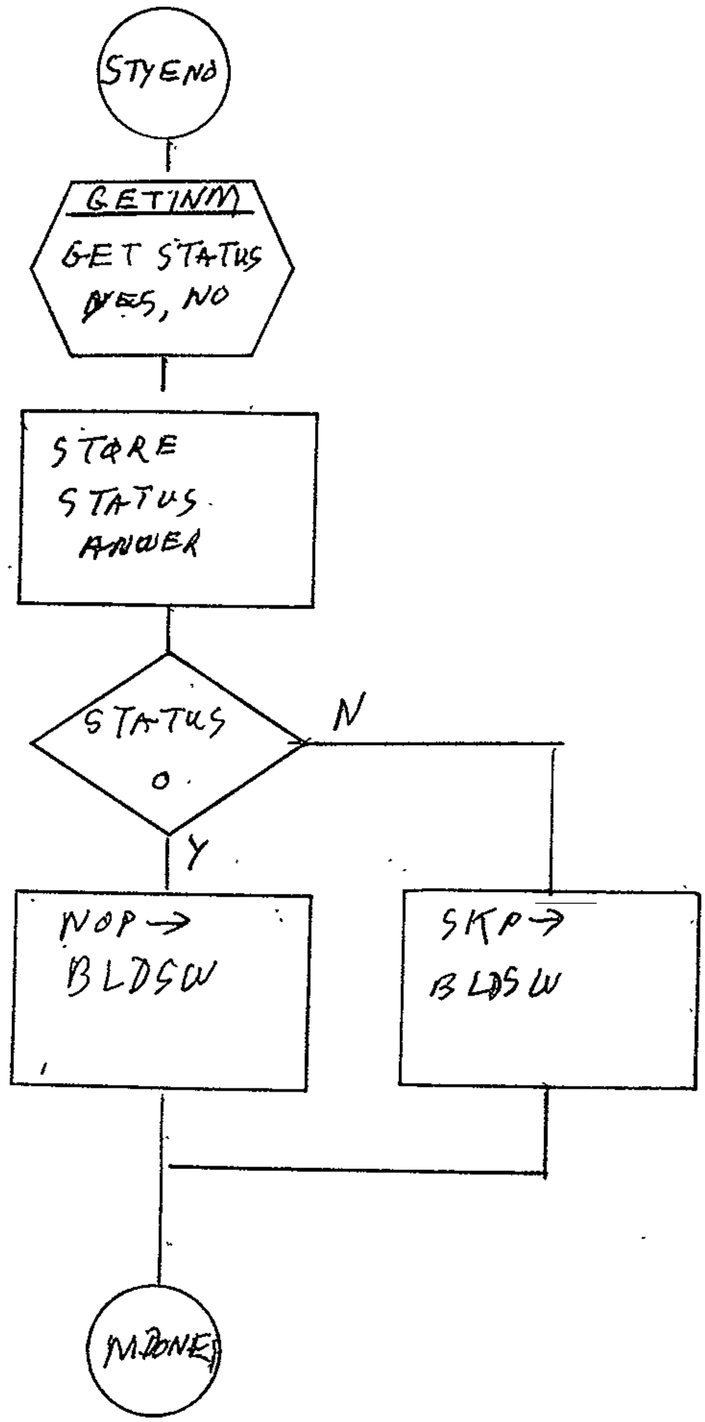

LACEOV
MØNINT
'END ØF VØL' MESSAGE
ITAPNØ
ACCEPT NEW TAPE NUMBER
SKP→LATPCH
SET SW TO MØVE NEW TAPE # IN TITLE
RETURN

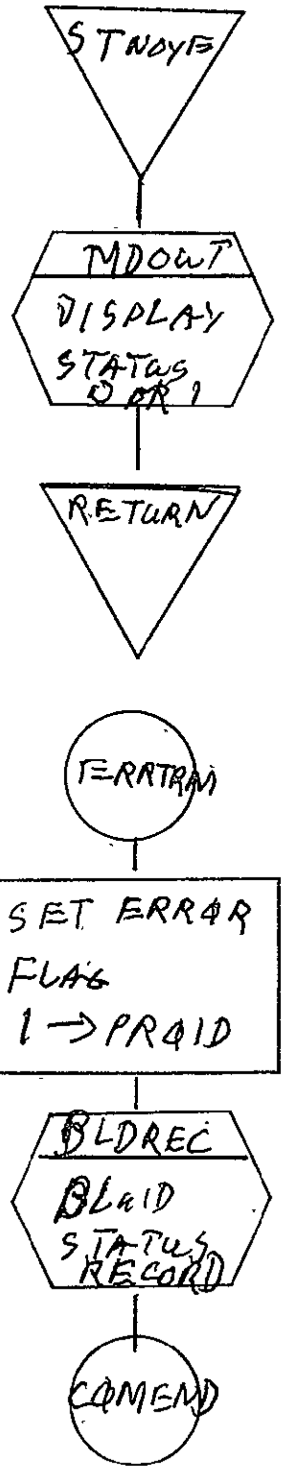

LACEND
INSET3
SET TITLE INTENSITY
CFIW
FINISH FICHE TITLING
COMOST
WRITE STATUS
RETURN

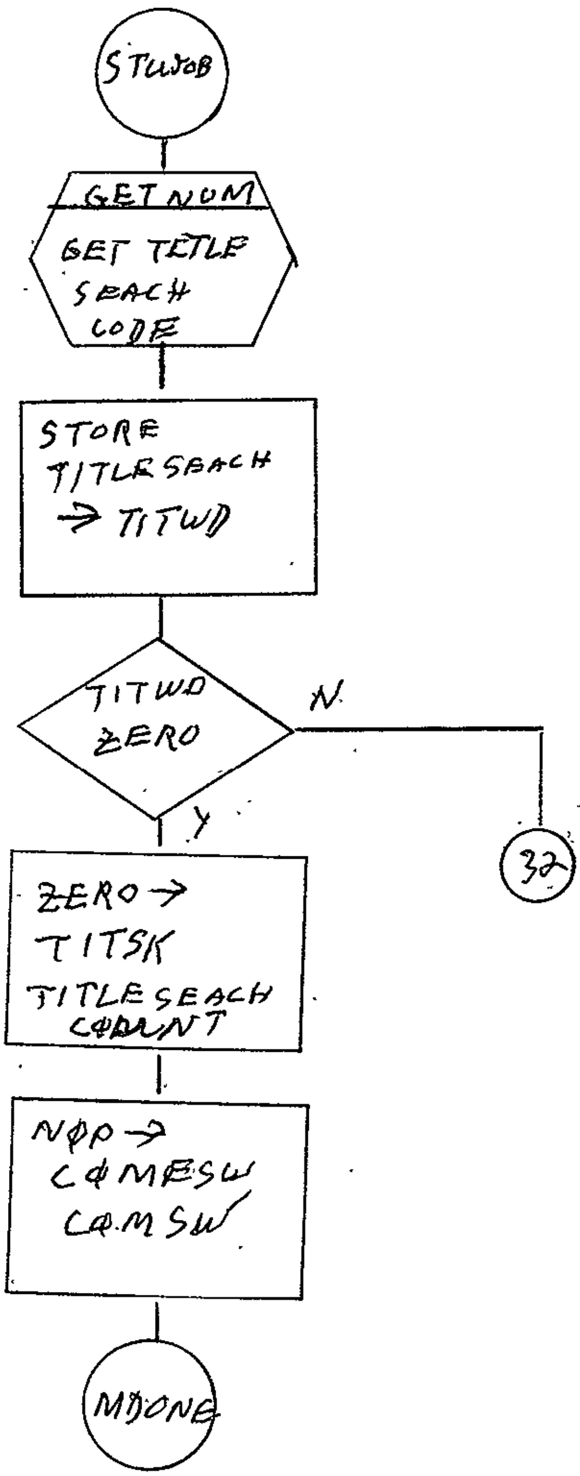

UNLEND
SETPLS
LACEND
OUTPUT REST OF TITLE
ACCTG
OUTPUT ACCOUNTING TO TTY
MDONE

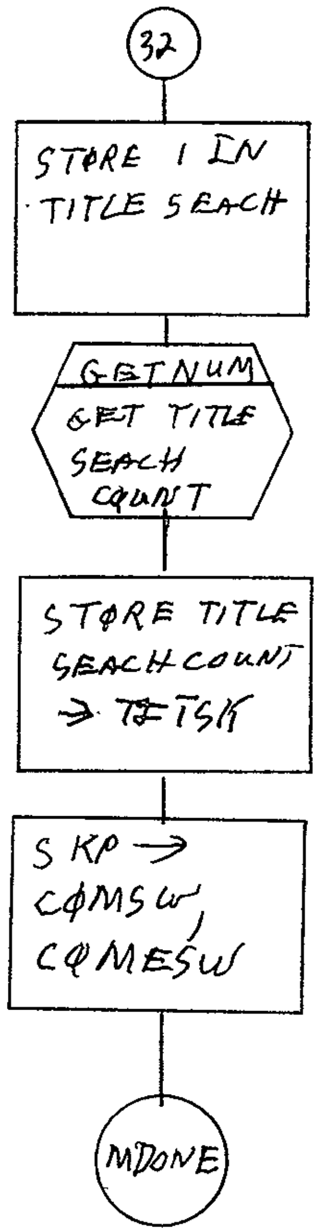

FRFLAS
FØRM REAД IN
N
Y
SET FØRM PIONTE FRMPTR
RETURN
CMTØP → TØPY
CMLEFT → LEFTY
FLASH
FLASH FØRM
SETPLS
RETURN

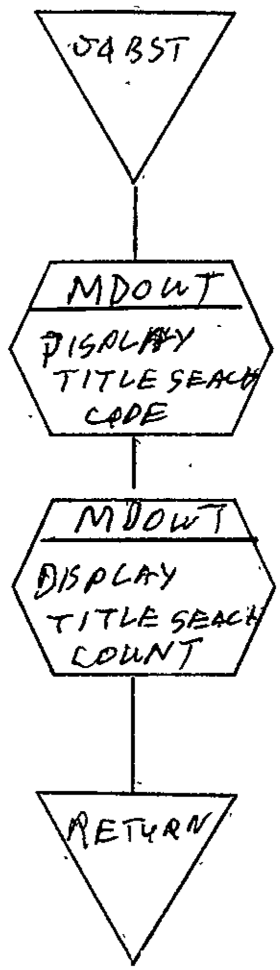

TYPFRX
MMESSG
DISPLAY FORM NAME
RETURN
FICOUNT
ADD TO FICHE COUNT BFITOT
RETUR

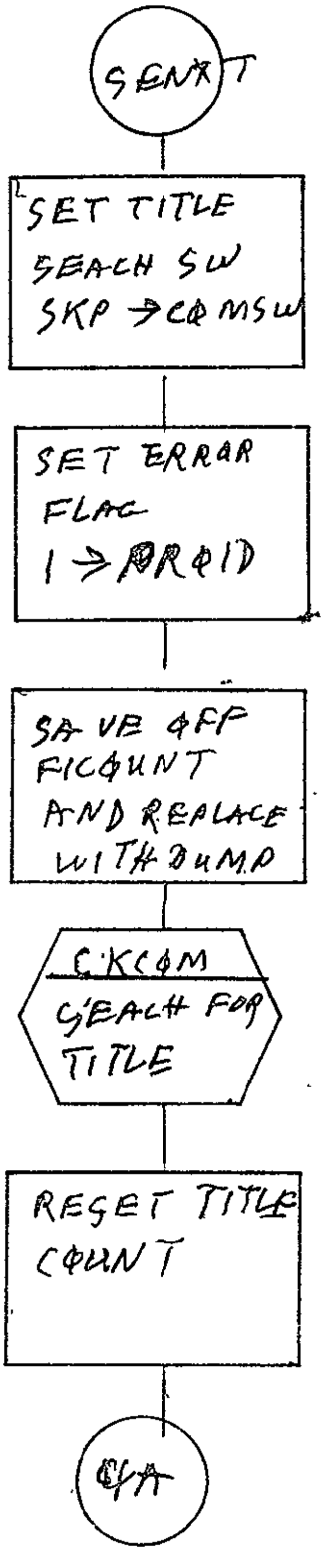

STYEND
GETINM
GET STATUS
YES, NO
STORE
STATUS
ANWER
STATUS
0
N
Y
NOP →
BLDSW
SKP →
BLDSW
MDONE


STNOYE
MDOWT
DISPLAY STATUS 0 OR 1
RETURN
ERRTRN
SET ERROR FLAG
1 → PROID
BLDREC
BUILD STATUS RECORD
COMEND


STWJOB
GETNUM
GET TITLE SEACH CODE
STORE TITLESEACH → TITWD
TITWD ZERO
N
Y
32
ZERO → TITSK TITLESEACH COUNT
NØP → CØMESW CØMSW
MDONE


32
STORE 1 IN TITLE SEACH
GETNUM
GET TITLE SEACH COUNT
STORE TITLE SEACH COUNT → TFTSK
SKP → COMSW, COMESW
MDONE


U4BST
MDOWT
DISPLAY
TITLE SEACH
CODE
MDOWT
DISPLAY
TITLE SEACH
COUNT
RETURN


SET TITLE
SEACH SW
SKP → COMSW
SET ERROR FLAG
SAVE OFF FICOUNT AND REALACE WITH DUMP
CKCOM
SEACH FOR TITLE
RESET TITLE COUNT

APPENDIX A

SOFTWARE AND TEST TAPE REQUIREMENT SPECIFICATIONS AND ACCEPTANCE TEST PROCEDURES

The applicable documents listed in paragraph 1.3 of this volume may be obtained from the SISO Data Control Unit, 488-1270, ext. 393, if needed. Documents should be requested by document number as shown in paragraph 1.3.

APPENDIX B

PROGRAM REVISIONS AND TEST PREPARATION SHEETS

The following paragraphs list revisions to each program described in the text of this volume, including date and author of revision and test preparation sheet (TPS) number (JSC form 1225). Where applicable, copies of the TPS are included, along with additional explanatory material.

B.1 COMA DTE PROCESSORS FOR 16 mm FILM (16DT36, 16DT48), AND 10 mm FICHE (105DT6, 105DT8)

See paragraph 2.1. Revisions are as follows:

Date	Author	EO/TPS No.
20 May 1972	W. T. Jackson	E0127F - TPS A1
31 October 1972	W. T. Jackson	E0127F - TPS A2

TPS No. A1 and A2 follow.

1. TYPE: A Configuration Change / B Non-Configuration Change	**TEST PREPARATION SHEET** NASA - MANNED SPACECRAFT CENTER	2. TPS No 127F - A1
4. Mod Sheet Number		3. S/C Cat No.
		5. Page 1 of 2
6. S C No Model No	7. Date / 8. Time	9. Need Date
10. Drawings, Documents, Ocp's, & Part Number(s)		11. Contract Number
		12. Serial Number
13. System COM		14. Ref E. O. Number 127F
15. TPS Short Title DTE 7th Size Character & 16mm Cut Marks		16. Wt. Req
17. Reason for Work.		

18 DESCRIPTION (Print or Type)	21 Tech.	Insp. 22 CON	23 NASA
PART 1 - DTE 7th SIZE CHARACTER			
1. LOAD 16DTE48-UCAM PROGRAM	✓		
2. LOAD 7th SIZE DTE TEST TAPE	✓		6-20-72 RD
3. TYPE UNLABELED ON TELETYPE	✓		
4. TYPE GO TO INITIATE PROCESSING	✓		
5. NOTE DATA IS DISPLAYED ON CRT AS IT IS RECORDED	✓		
~~6. VERIFY END OF FILE MESSAGE ON TTY~~ Steps 6 & 7 cont.			
~~7. TYPE END OF JOB TO TERMINATE PROCESSING~~ on page 2/2			
8. VERIFY RESULTS OF 132 CHAR/LINE, 64 LINE/PAGE	✓		
PART 2 - 16mm CUTMARKS			
1. LOAD CLEAN 16mm CUTMARK PROGRAM	✓		
2. LOAD COM TEST TAPE 1A	✓		
3. TYPE GO TO INITIATE PROCESSING	✓		
4. NOTE DATA AND CUTMARKS ARE DISPLAYED ON CRT AS IT IS RECORDED	✓		
5. VERIFY RESULTS OF PROCESSING ON 16mm FILM (PRESENCE OF CUTMARKS)	✓	PHD RSP	

19 Prepared By	20. Final Acceptance Date
L. S. Lockler	

REFER TO PROCEDURES FOR REQUIRED SIGNATURES		REFER TO PROCEDURES FOR REQUIRED SIGNATURES	
Contractor	Date	NASA	Date
L S Lockler	6-20-72	[illegible signature]	6/20/72
[illegible signature]	6-20-72	[illegible signature]	6/20/72

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CONTINUATION SHEET

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TPS No	127F - A1	
S/C	Cat	No
Page 2 of 2		

	DESCRIPTION (Print or Type)	Tech	Insp. Cont	Insp. NASA
	6. PROCESS FILM ON XEROX COPYFLO IN BUILDING 227 TO VERIFY COMPATIBILITY	✓		
	PART 1 (CONTINUED)			
	6. NOTE TAPE ERROR ON TTY	✓	PHO 22	
	7. TYPE CONTINUE AND NOTE RETURN TO MONITOR	✓		
			6-20-72	
	RETURN TO PAGE 1 FOR STEP 8.			

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TEST PREPARATION SHEET
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1. TYPE	A Configuration Change / B Non Configuration Change
2. TPS No	E.O. 127F-A2
3. S/C	Cat / No
4. Mod Sheet Number	
5. Page	1 of 5
6. S C No / Model No	
7. Date	
8. Time	
9. Need Date	
10. Drawings, Documents, Ocp's, & Part Number(s)	/
11. Contract Number	
12. Serial Number	
13. System	Computer Output Microfilm FR80
14. Ref. E. O Number	127F
15. TPS Short Title	16mm DTE 36/48 Bit Cutmarks & Job ID
16. Wt. Req	

17. Reason for Work. To A/T the 16mm DTE Programs to provide for modifications as defined in E.O. 127F, Section 2.2a.

18 DESCRIPTION (Print or Type)	21. Tech	22 CONT.	23 NASA
The purpose of this test is to demonstrate the capability of the 16mm DTE Programs to output the Job ID Records (76 seconds) and to output cutmarks on either every frame or at the beginning of each job only, depending on the STRIP CHART option parameter.			
I. This portion of the test demonstrates the ability to output the Job ID Records and to output cutmarks on each frame using DTE 36 Bit data.			
a. At the tape transport:			
(1) Mount TAPE 3Q and set UNIT SELECT switch to Unit 1.	✓		
b. At the teletype:			
(1) Type CNTRL D to load Disk Debug. Verify page of previous program on the CRT.	✓		

19. Prepared By L S Loeckler

20. Final Acceptance Date

REFER TO PROCEDURES FOR REQUIRED SIGNATURES

Contractor	Date	NASA	Date
L S Loeckler (PHO DVC)	10/21/72	E E Jones	10/31/72
SA Van Ann (PHO QA)	10-31-72	M.D. Hensley	10/31/72

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TPS No	E.O. 127F -A2	
S.C	Cat	No.
Page 2 of 5		

DESCRIPTION (Print or Type)	Tech	Insp Cont	Insp NASA
(2) Type FR8; 16DT36$J to load the 16mm DTE 36 Bit program. Verify that * MONITOR is typed on the teletype.	✓		
(3) Type UNLABELLED/↓ for unlabelled tape processing.	✓		
(4) Verify * OK is typed on the teletype.	✓		
(5) Type GO/↓ to initiate TAPE 3Q processing. Verify that the starting time and frame number are typed on the teletype. NOTE - that all data is displayed on CRT monitor as it is recorded.	✓		
(6) Verify that elapsed job time, frame number, and * END OF FILE are typed on the teletype.	✓		
(7) Type REWIND/↓ to rewind TAPE 3Q. Verify that * OK is typed on the teletype.	✓		
(8) Type CLEAR/↓ at the teletype. Verify that * OK is typed on the teletype.	✓		
II. This portion of the test demonstrates the ability to output the Job ID Records and to exercise the STRIP CHART option to output cutmarks once per job and on an end of file, DTE 36 bit.			
a. At the teletype:			
(1) Type STRIP CHART/↓ on the teletype to exercise option of cutmarks once per job. Verify * OK is typed on the teletype.	✓		
(2) Type UNLABELLED/↓ . Verify * OK.	✓		

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CONTINUATION SHEET

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TPS No	E.O. 127F-A2	
S/C	Cat.	No
	Page 3 of 5	

	DESCRIPTION (Print or Type)	Tech	Insp Cont.	Insp NASA
	(3) Type GO/↓ to initiate TAPE 3Q processing. Verify that the starting time, frame number, are typed on the teletype. NOTE - that all data is displayed on the CRT monitor as it is recorded.	✓		
	(4) Verify that elapsed job time, frame number, * END OF FILE is typed on the teletype.	✓		
	(5) Type REWIND/↓ to rewind TAPE 3Q. Verify that * OK is typed on the teletype.	✓		
	(6) Type CLEAR/↓ at the teletype. Verify that * OK is typed on the teletype.	✓		
	b. At the tape transport:			
	(1) Verify that TAPE 3Q is rewound to load point.	✓		
	(2) Dismount TAPE 3Q.	✓		
III.	This portion of the test demonstrates the ability to output the Job ID Records and to output cutmarks on each frame using DTE 48 Bit data.			
	a. At the tape transport:			
	(1) Mount TAPE 5Q and set unit select switch to Unit 1.	✓		
	b. At the teletype:			
	(1) Type CNTRL D to load Disk Debug. Verify * DEBUG is typed on teletype.	✓		
	(2) Type FR8;16DT48$J to load the 16mm DTE 48 Bit program. Verify that * MONITOR is typed on the teletype.	✓		

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TPS No	E.O. 127F-A2	
S/C	Cat.	No
Page 4 of 5		

DESCRIPTION (Print or Type)	Tech	Insp Cont	Insp NASA
(3) Type UNLABELLED/ for unlabelled tape processing.	✓		
(4) Verify * OK is typed on the teletype.	✓		
(5) Type GO/ to ~~XXXXXXX~~ initiate TAPE 5Q processing. Verify that the starting time and frame number are typed on the teletype. NOTE - that all data is displayed on the CRT monitor as it is recorded.	✓		
(6) Verify that elapsed time, frame number and * END OF FILE are typed on the teletype.	✓		
(7) Type REWIND/ to rewind TAPE 5Q. Verify that * OK is typed on the teletype.	✓		
(8) Type CLEAR/ at the teletype. Verify * OK is typed on the teletype.	✓		
IV. This portion of the test demonstrates the ability to output the Job ID Records and to exercise the STRIP CHART option to output cutmarks once per job and on an end of file. DTE 48 bit.			
a. At the teletype:			
(1) Type STRIP CHART/ on the teletype to exercise option of cutmarks once per job and on receipt of end of file. Verify * OK is typed on the teletype.	✓		
(2) Type UNLABELLED/ . Verify * OK on teletype.	✓		

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TPS No	E.O. 127F-A2	
S.C	Cat	No
Page 5 of 5		

DESCRIPTION (Print or Type)	Tech	Insp Cont	Insp NASA
(3) Type GO// to initiate TAPE 5Q processing/ Verify that the starting time and frame number are typed on the teletype. NOTE - that all data is displayed on the CRT monitor as it is recorded.	✓		
(4) Verify that elapsed job time, frame number, and * END OF FILE is typed on the teletype.	✓		
(5) Type REWIND/' to rewind TAPE 5Q. Verify that * OK is typed on the teletype.	✓		
(6) Type CLEAR/, at the teletype twice. Verify that * OK is typed on the teletype after each clear.	✓		
b. At the tape transport:			
(1) Verify that TAPE 5Q is rewound to load point.	✓		
(2) Dismount TAPE 5Q.	✓		
V. Develop the film and verify that the Job ID and cutmarks are recorded as described in the tests. Verify that the frames of DTE data are identical to pages 59-64 of the COM System ATP. Note missing vectors in worst case Vector Test (page 59) and Vector Test (page 62) is same as original A/T. Data for vectors left off of data tapes.			

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B.2 COMA GRAY-LEVEL, LANDSCAPE, AND CLASSIFICATION MAP PROCESSOR FOR 105 mm FICHE (CLAGRA)

See paragraph 2.2. Revisions are as follows:

Date	Author	EO/TPS No.
13 October 1972	W. T. Jackson	EO-155F - TPS A2A
13 October 1972	W. T. Jackson	EO-155F - TPS A2B
20 October 1972	W. T. Jackson	EO-155F - TPS A2C
14 May 1975	J. E. Bennett	TPS A3

TPS No. A2A, A2B, A2C and A3 follow. For TPS No. A2A, see also paragraph B.2.1, tables B-1 through B-4 and figures B-1 through B-3. For TPS No. A2B, see also paragraph B.2.2, tables B-5 through B-11 and figures B-4 through B-7. For TPS A2C, see also paragraph B.2.3, tables B-12 through B-16 and figures B-8 and B-9.

1. TYPE: A Configuration Change; B Non-Configuration Change	**TEST PREPARATION SHEET** **NASA - MANNED SPACECRAFT CENTER**	2 TPS No E.O. 155F #2A2A
4. Mod Sheet Number		3 S/C Cat. No
		5 Page 1 of 3
6 S/C No /Model No	7. Date / 8 Time	9 Need Date 13 October 1972
10 Drawings, Documents, Ocp's, & Part Number(s)		11 Contract Number NAS 9-1261
		12 Serial Number
13. System Computer to Microfilm		14 Ref E O Number 155F
15 TPS Short Title Classification Map Software Acceptance Test		16. Wt Req.

17. Reason for Work To verify the software development on the COM Systen. for the Classification Map Software as defined in PHO-TN598 and as required under E.I. #1 E.O. 155F.

18 DESCRIPTION (Print or Type)	21. Tech	Insp 22 CONT	Insp 23 NASA
Refer to the attached handout for a description of the tests and the test results.			
TEST PROCEDURES			
a. At the Tape Transport:			
(1) Mount Classification Map Acceptance Test Tape (Tape 1). ✓			
b. At the Teletype:			
(1) Type GRA;CLASS$J to load Classification Map Program. Verify that *MONITOR is typed on the teletype. ✓			
(2) Type UNLABELLED/↓ . Verify that *OK is typed on the teletype. ✓			

19. Prepared By	20 Final Acceptance Date
L. S. LOCKLER	

REFER TO PROCEDURES FOR REQUIRED SIGNATURES		REFER TO PROCEDURES FOR REQUIRED SIGNATURES	
Contractor	Date	NASA	Date
L. S. Lockler	10/13/72	H. L. Donagan	10/13/72
B. J. Davis	10/13/72	R. L. Bryant	10/13/72

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TPS No	E.O. 155F #A2A	
S/C	Cat	No
Page 2 of 3		

DESCRIPTION (Print or Type)	Tech	Insp Cont	Insp NASA
b. (3) Type CLEAR/↓ twice to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/↓.			
(4) Type GO/↓ to initiate processing of the Classification Map Acceptance Test Tape (Tape 1). Verify that the starting time and frame number are typed on the teletype.			
(5) Verify that elapsed job time, frame number, page number, and *END OF FILE are typed on the teletype to signal completion of data tape processing.			
(6) Type END JOB/↓ to complete processing of the Classification Map Acceptance Test Tape (Tape 1). Verify that *OK is typed on the teletype.			
(7) Type CLEAR/↓ twice to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/↓.			
(8) Type REWIND/↓ to rewind the Classification Map Acceptance Test Tape (Tape 1). Verify that *OK is typed on the teletype.			

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CONTINUATION SHEET

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TPS No E.O. 155F#2A

S/C | Cat. | No

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DESCRIPTION (Print or Type)	Tech	Insp Cont	Insp NASA
c. At the Tape Transport:			
(1) Dismount the Classification Map Acceptance Test Tape (Tape 1).			
d. Test Result Verification:			
(1) Process 105mm film containing results.			
(2) View the resulting 105mm microfiche on the Datagraphix, or have hardcopies made from the microfiche. Verify that the results match the tests described in the attached test description.			

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B.2.1 Classification Map Acceptance Test. The Classification Map Acceptance Test utilizes a tape (tape 1) containing a series of four tests as described below and summarized in table B-1.

A. Test 1, Maximum Image Size. This test shall consist of classification data to build a classification map image of 200 lines containing 350 characters each. This image shall demonstrate maximum size. Display data shall consist of the alphabet with the first line containing all A's, the second all B's, the third all C's, etc. for a maximum of 200 lines as illustrated in figure B-1.

B. Test 2, Overlay Data. This test shall consist of the same data pattern as test 1. However, overlay data as defined in table B-2 and B-3 shall be included to demonstrate the overlay capability (see figure B-2).

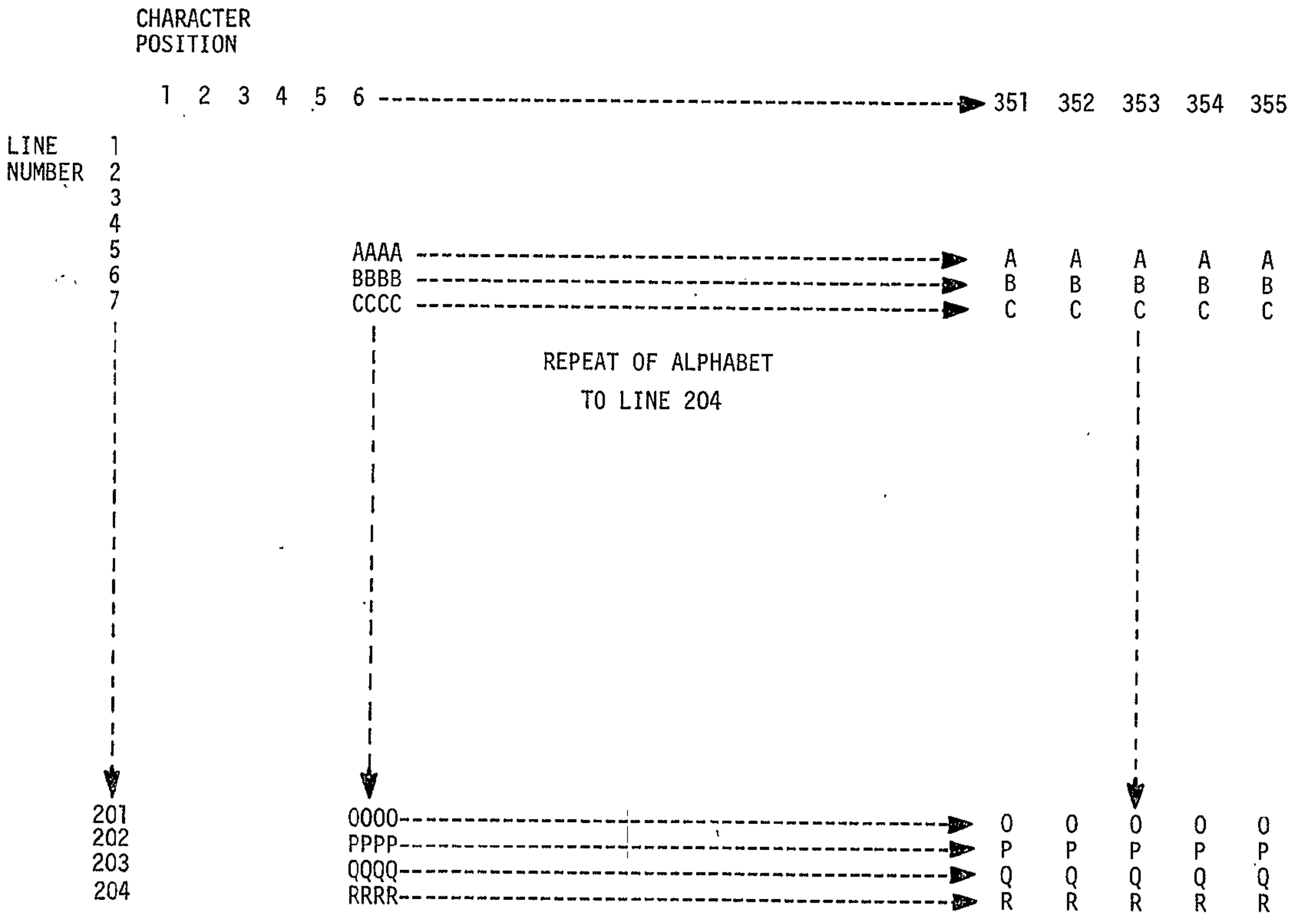
C. Test 3, Multiple Images. This test shall consist of a COM control record for titling (see table B-4) followed by classification control and data records to generate 10 frames of images identical to those defined in test 2.

D. Test 4, Descriptor Frame. This test shall consist of data to build a descriptor frame of 64 lines containing 132 characters each. Display data shall consist of alphanumeric characters with the first line containing all A's, the second all B's, etc., for a maximum of 64 lines as illustrated in figure B-3. Preceding the data for this test are two descriptor control records with zero line and column parameters. This will cause two frames to be shipped before the descriptor frame is output.

TABLE B-1

CLASSIFICATION TESTS

TEST NO.	FUNCTION	CONTENT/FORMAT
1	TEST MAXIMUM CLASSIFICATION MAP IMAGE SIZE	SPANNED VARIABLE LENGTH RECORD TO TEST MAXIMUM CLASSIFICATION MAP IMAGE SIZE. (TEST DISPLAY DEFINED IN PARA. A.)
2	TEST OVERLAY CAPABILITY ON CLASSIFICATION MAP	SPANNED VARIABLE LENGTH RECORD TO TEST OVERLAY CAPABILITY (TEST DISPLAY DEFINED IN PARA. B.)
3	TEST MULTIPLE IMAGES PER FICHE WITH CLASSIFICATION DATA	SPANNED VARIABLE LENGTH RECORDS TO TEST MULTIPLE IMAGES PER FICHE. (TEST DISPLAY DEFINED IN PARA. C.)
4	TEST MAXIMUM SIZE DESCRIPTION FRAME. TEST FRAME SKIP OPTION.	SPANNED VARIABLE LENGTH RECORD TO TEST DESCRIPTOR FORMAT. (TEST DISPLAY DEFINED IN PARA. D.)



NOTE: DASHED LINES AND COORDINATES NOT INCLUDED ON DISPLAY; FOR REFERENCE ONLY.

Figure B-1 Classification Map Data (200 Lines of 350 characters)

TABLE B-2

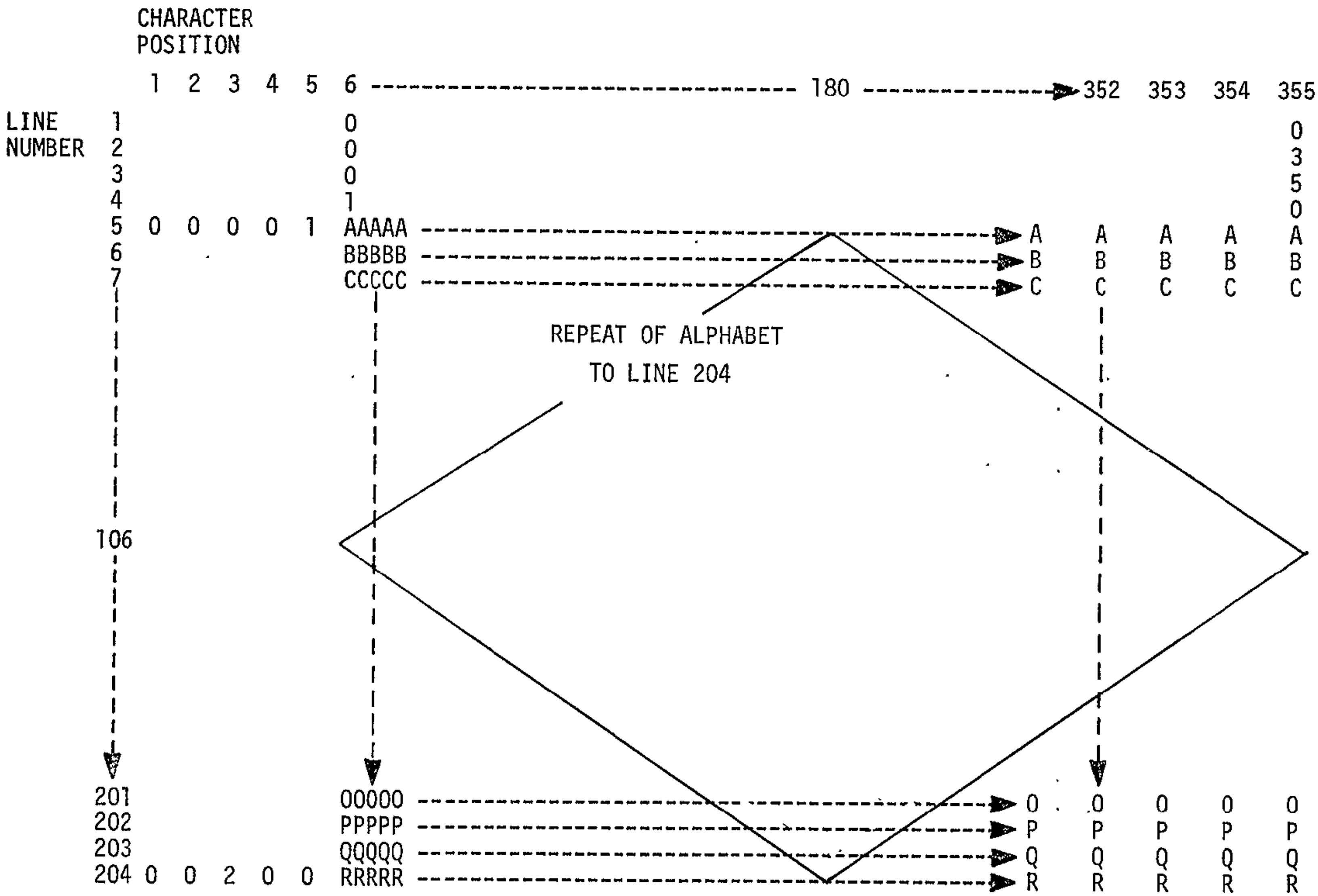
NUMERIC OVERLAY INFORMATION FOR CLASSIFICATION TEST 2

LINE NO.	CHARACTER POSITION	DATA
1	6	0
2	6	0
3	6	0
4	6	1
1	355	0
2	355	3
3	355	5
4	355	0
5	1	0
5	2	0
5	3	0
5	4	0
5	5	1
204	1	0
204	2	0
204	3	2
204	4	0
204	5	0

TABLE B-3

VECTOR OVERLAY INFORMATION FOR CLASSIFICATION TEST 2

VECTOR	START	STOP
1	CHAR POS 6 LINE 106	CHAR POS 180 LINE 5
2	CHAR POS 6 LINE 106	CHAR POS 180 LINE 204
3	CHAR POS 180 LINE 204	CHAR POS 355 LINE 106
4	CHAR POS 355 LINE 106	CHAR POS 180 LINE 5



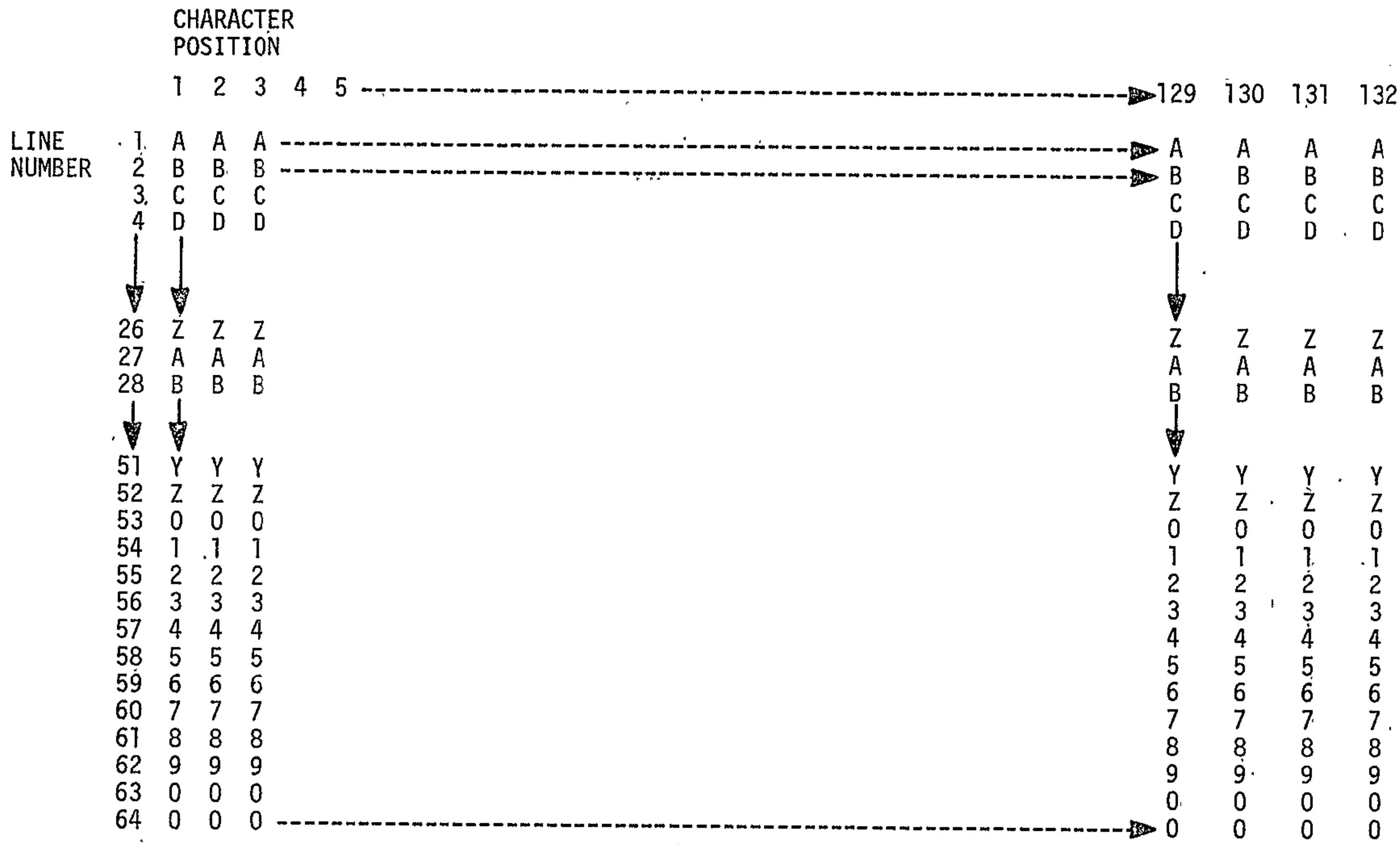
NOTE: DASHED LINES AND COORDINATES NOT INCLUDED ON DISPLAY; FOR REFERENCE ONLY.

Figure B-2 Classification Map Data with Overlays

TABLE B-4

USER FICHE TITLES

TAPE NO.	TITLE
1	CLASSIFICATION MAP TEST FICHE
1 (TEST 3)	MULTIPLE IMAGE AND DESCRIPTOR TEST FICHE
2	GRAY-LEVEL TEST FICHE
3	LANDSCAPE TEST FICHE



NOTE: DASHED LINES AND COORDINATES NOT INCLUDED ON DISPLAY; FOR REFERENCE ONLY.

Figure B-3 Descriptor Data (64 Lines of 132 characters)

TYPE A Configuration Change / B Non Configuration Change	**TEST PREPARATION SHEET** NASA - MANNED SPACECRAFT CENTER	2 TPS No. E.O. 155F 42B	
4 Mod Sheet Number		3 S C	Cat / No
		5 Page 1 of 4	
6 S C No Model No	7. Date / 8 Time	9 Need Date 13 October 1972	
10 Drawings, Documents, Ocp's & Part Number(s)		11. Contract Number NAS 9-1261	
		12 Serial Number	
13. System Computer to Microfilm		14 Ref E O Number 155F	
15 TPS Short Title Gray Level Software Acceptance Test		16 WI Req.	

17 Reason for Work. To verify the software development on the COM System for the gray level software as defined in PHO-TN598 and as required under E.I. #1 of E.O. 155F

18. DESCRIPTION (Print or Type)	21 Tech	Insp 22 CONT	23 NASA
TEST PROCEDURES			
1. Gray-Level Acceptance Test - Tape 2			
a. At the Tape Transport:			
(1) Mount Gray-Level Acceptance Test Tape (Tape 2). ✓			
b. At the Teletype:			
(1) Type GRA;GRAY $J to load Gray-Level Program. Verify that *MONITOR is typed on the teletype. ✓			
(2) Type UNLABELLED/↓ . Verify that *OK is typed on the teletype. ✓			
(3) Type CLEAR/↓ twice to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/↓ . ✓			

19 Prepared By L. S. LOCKLER	20 Final Acceptance Date
REFER TO PROCEDURES FOR REQUIRED SIGNATURES	REFER TO PROCEDURES FOR REQUIRED SIGNATURES

Contractor	Date	NASA	Date
L. S. Lockler	10/13/72	[illegible]	10/13/72
[illegible]	10/13/72	[illegible]	10/13/72

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TEST PREPARATION SHEET CONTINUATION SHEET NASA - MANNED SPACECRAFT CENTER	TPS No E.O. 155F 126	S/C	Cat	No	Page 2 of 4

	DESCRIPTION (Print or Type)	Tech	Insp Cont	Insp NASA
	b. (4) Type GO/↓ to initiate processing of the Gray-Level Acceptance Test Tape (Tape 2). Verify that the starting time and frame number are typed on the teletype. ✓			
	(5) Verify that the elapsed job time, frame number, page number, and *END OF FILE are typed on the teletype to signal completion of data tape processing. ✓			
	(6) Type END JOB/↓ to complete processing of the Gray-Level Acceptance Test Tape (Tape 2). Verify that *OK is typed on the teletype. ✓			
	(7) Type CLEAR/↓ to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/↓ . ✓			
	(8) Type REWIND/↓ to rewind the Gray-Level Acceptance Test Tape (Tape 2). Verify that *OK is typed on the teletype. ✓			
	(9) Type CNTRL D to return to DEBUG. Verify *DEBUG is typed on the teletype.			
	c. At the Tape Transport:			
	(1) Dismount the Gray-Level Acceptance Test Tape (Tape 2). ✓			

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DESCRIPTION (Print or Type)	Tech	Insp Cont	Insp NASA
2. Gray-Level Acceptance Test - Tape 2A			
a. At the Tape Transport:			
(1) Mount Gray-Level Acceptance Test Tape (Tape 2A). ✓			
b. At the Teletype:			
(1) Type GRA;GRAY$J to load Gray-Level Program. Verify that *MONITOR is typed on the teletype. ✓			
(2) Type SKIP/↓ to bypass the standard label on the tape. Verify that *OK is typed on the teletype. ✓			
(3) Type UNLABELLED/↓ . Verify that *OK is typed on the teletype. ✓			
(4) Type CLEAR/↓ to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/↓ . ✓			
(5) Type GO/↓ to initiate processing of the Gray-Level Acceptance Test Tape (Tape 2A). Verify that the starting time and frame number are typed on the teletype. ✓			
(6) Verify that the elapsed job time, frame number, page number, and *END OF FILE are typed on the teletype to signal completion of data tape processing. ✓			

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CONTINUATION SHEET
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TPS No E.O. 155F ~~#5~~ A2B
S/C | Cat. | No
Page 4 of 4

DESCRIPTION (Print or Type)	Tech.	Insp Cont	Insp NASA
b. (7) Type END JOB/↓ to complete processing of the Gray-Level Acceptance Test Tape (Tape 2). Verify that *OK is typed on the teletype. ✓			
(8) Type CLEAR/↓ twice to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/↓ . ✓			
(9) Type REWIND/↓ to rewind the Gray-Level Acceptance Test Tape (Tape 2A). Verify that *OK is typed on the teletype. ✓			
c. At the Tape Transport:			
(1) Dismount the Gray-Level Acceptance Test Tape (Tape 2A).			
d. Test Result Verification:			
(1) Process 105mm film containing results. ✓			
(2) View the resulting 105mm microfiche on the Datagraphix, or have hardcopies made from the microfiche. Verify that the results match Test 1 as described in Paragraph 1. of the accompanying handout and Test 2, Test 3, and Test 4 as described in Paragraphs 2, 3, and 4 respectively. ✓			

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B.2.2 Gray-Level Acceptance Test. The Gray-Level Acceptance Test utilizes two tapes (2 and 2A) consisting of the tests described below and summarized in Table B-5.

A. Test 1, Maximum Size and Overlay. This test shall be contained on tape 2 and shall consist of gray-level and overlay data to build eight images of 1024 lines and 1024 columns. This will demonstrate maximum size and multiple images per fiche. Gray-level data shall consist of 1000 lines, each line containing 1000 pixels. Overlay data shall be constructed as shown in figure B-4 and tables B-6 and B-7. Each image will be unique gray-level as defined in figure B-4.

B. Test 2, X Shade Bars. This test and tests 3 and 4 shall be contained on tape 2A. Test 2 shall consist of 1000 lines of gray-level data, each line containing 1000 pixels. This pattern shall demonstrate both ascending and descending shade bars in the X-axis and shall be constructed as illustrated in figure B-5. The first 500 lines shall be identical and shall consist of a descending shade pattern. The next 500 lines shall be identical and consist of an ascending shade pattern. The test 2 overlay information shall be included in the same logical record as the gray-level data. Overlay data is illustrated in figure B-5 and defined in tables B-8 and B-9.

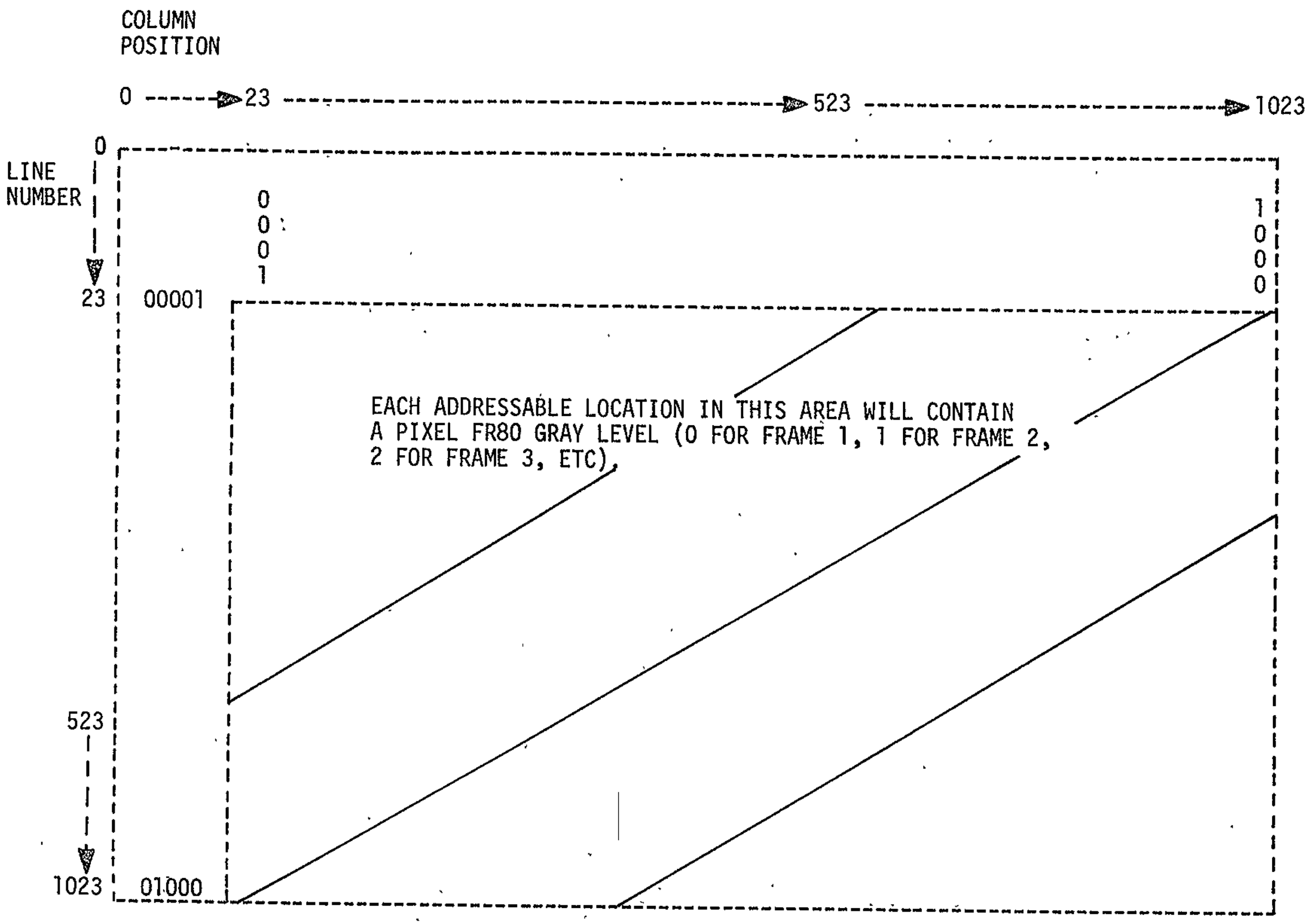
C. Test 3, Y Shade Bars. This test shall consist of 1000 lines of gray-level data, each line containing 1000 pixels. This pattern will demonstrate both ascending and descending shade bars in the Y-axis, and shall be constructed as illustrated in figure B-6. The Test 3 overlay information shall be included in the same logical record as the gray-level data. Overlay data is illustrated in figure B-6 and defined in tables B-10 and B-11.

D. Test 4, Descriptor Frame. This test shall consist of data to build a descriptor frame of 64 lines containing 132 characters each. Display data shall consist of alphanumeric characters with the first line containing all A's, the second all B's, etc., for a maximum of 64 lines as illustrated in figure B-7.

TABLE B-5

GRAY-LEVEL TESTS

TEST NO.	FUNCTION	CONTENT/FORMAT
1	TEST MAXIMUM GRAY-LEVEL IMAGE SIZE, MULTIPLE IMAGES PER FICHE, AND OVERLAY CAPABILITIES	SPANNED VARIABLE LENGTH RECORD TO TEST MAXIMUM IMAGE SIZE, MULTIPLE IMAGES PER FICHE, AND OVERLAY CAPABILITIES (TEST DISPLAY IS DEFINED IN PARA. A.)
2	TEST ASCENDING AND DESCENDING SHADE BARS IN X-AXIS	SPANNED VARIABLE LENGTH RECORD TO CHECK EIGHT GRAY LEVELS (TEST DISPLAY IS DEFINED IN PARA. B.)
3	TEST ASCENDING AND DESCENDING SHADE BARS IN Y-AXIS	SPANNED VARIABLE LENGTH RECORD TO CHECK EIGHT GRAY LEVELS (TEST DISPLAY IS DEFINED IN PARA. C.)
4	TEST MAXIMUM SIZE DESCRIPTOR FRAME	SPANNED VARIABLE LENGTH RECORD TO TEST DESCRIPTOR FORMAT (TEST DISPLAY IS DEFINED IN PARA. D.)



NOTE: DASHED LINES AND COORDINATES NOT INCLUDED ON DISPLAY; FOR REFERENCE ONLY.

Figure B-4 Maximum Size and Overlay for Gray-Level

TABLE B-6

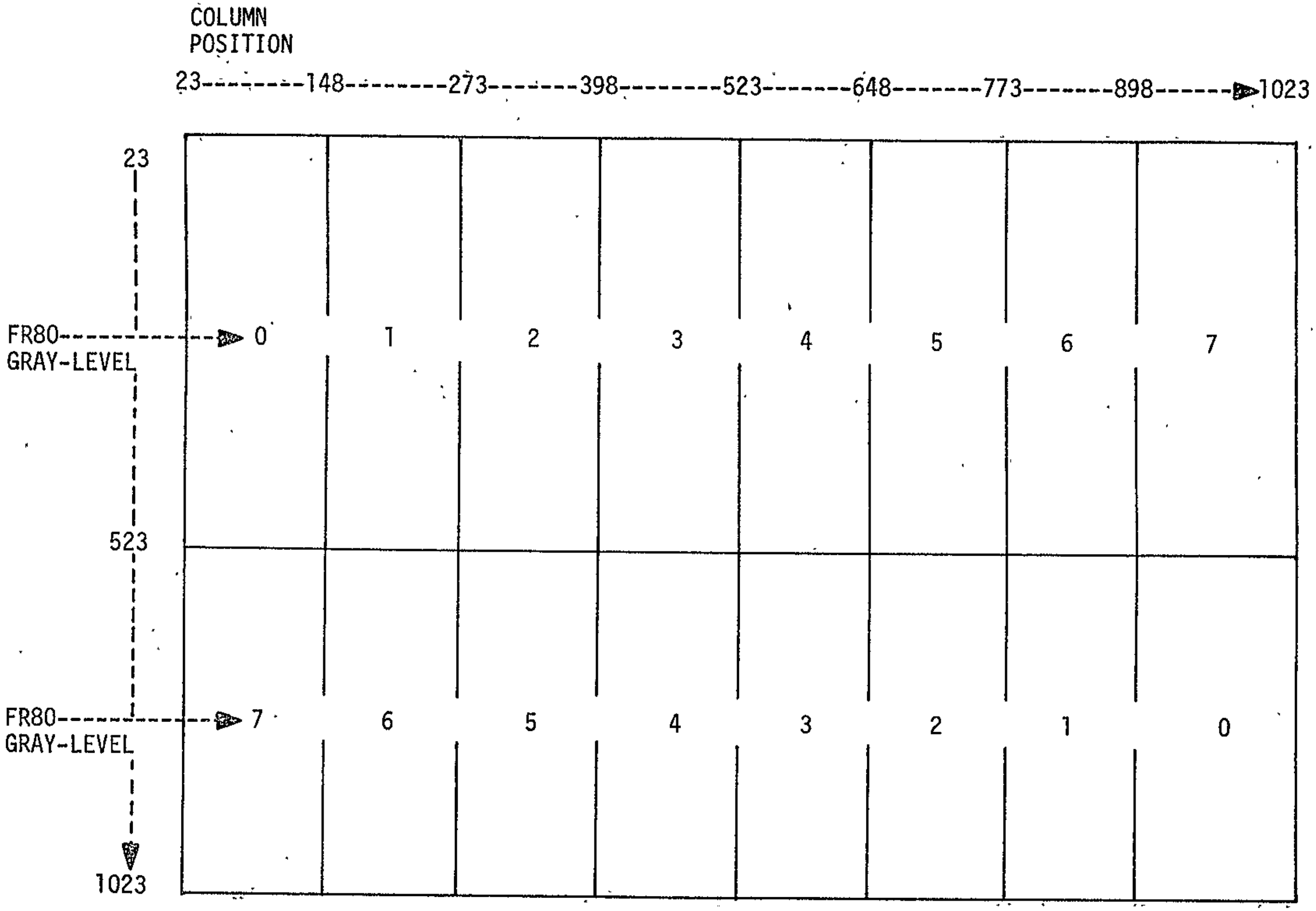
CHARACTER OVERLAY INFORMATION FOR GRAY-LEVEL TEST 1

LINE NO.	COLUMN	DATA
23	0	0
23	5	0
23	10	0
23	15	0
23	20	1
1023	0	0
1023	5	1
1023	10	0
1023	15	0
1023	20	0
5	23	0
11	23	0
17	23	0
23	23	1
5	1019	1
11	1019	0
17	1019	0
23	1019	0

TABLE B-7

VECTOR OVERLAY INFORMATION FOR GRAY-LEVEL TEST 1

STARTING POINT		ENDING POINT	
LINE	COL	LINE	COL
523	23	23	523
1023	23	23	1023
1023	523	523	1023



NOTE: DASHED LINES AND COORDINATES NOT INCLUDED ON DISPLAY; FOR REFERENCE ONLY.

Figure B-5 X Shade Bars and Overlay for Gray-Level

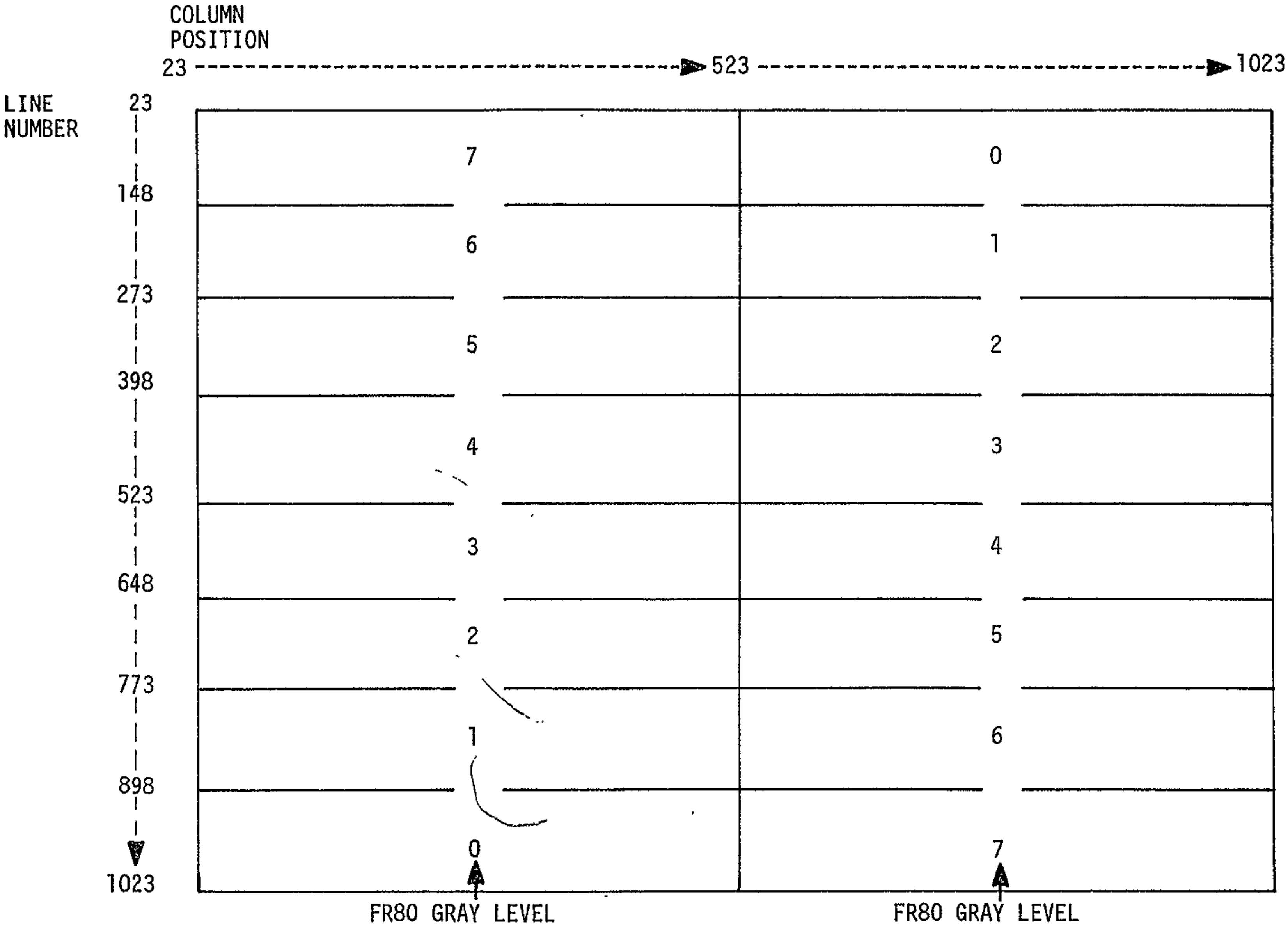
TABLE B-8
CHARACTER OVERLAY INFORMATION FOR GRAY-LEVEL TEST 2

LINE NO.	COLUMN POSITION	DATA
273	85	0
273	210	1
273	335	2
273	460	3
273	585	4
273	710	5
273	835	6
273	960	7
773	85	7
773	210	6
773	335	5
773	460	4
773	585	3
773	710	2
773	835	1
773	960	0

TABLE B-9

VECTOR OVERLAY INFORMATION FOR GRAY-LEVEL TEST 2

STARTING POINT		ENDING POINT	
LINE NO.	COLUMN POS.	LINE NO.	COLUMN POS.
23	23	1023	23
23	1023	1023	1023
23	23	23	1023
523	23	523	1023
1023	23	1023	1023
23	148	173	148
23	273	173	273
23	398	173	398
23	523	173	523
23	648	173	648
23	773	173	773
23	898	173	898
373	148	673	148
373	273	673	273
373	398	673	398
373	523	673	523
373	648	673	648
373	773	673	773
373	898	673	898
873	148	1023	148
873	273	1023	273
873	398	1023	398
873	523	1023	523
873	648	1023	648
873	773	1023	773
873	898	1023	898



NOTE: DASHED LINES AND COORDINATES NOT INCLUDED ON DISPLAY; FOR REFERENCE ONLY.

Figure B-6 Y Shade Bars and Overlay for Gray Level

TABLE B-10

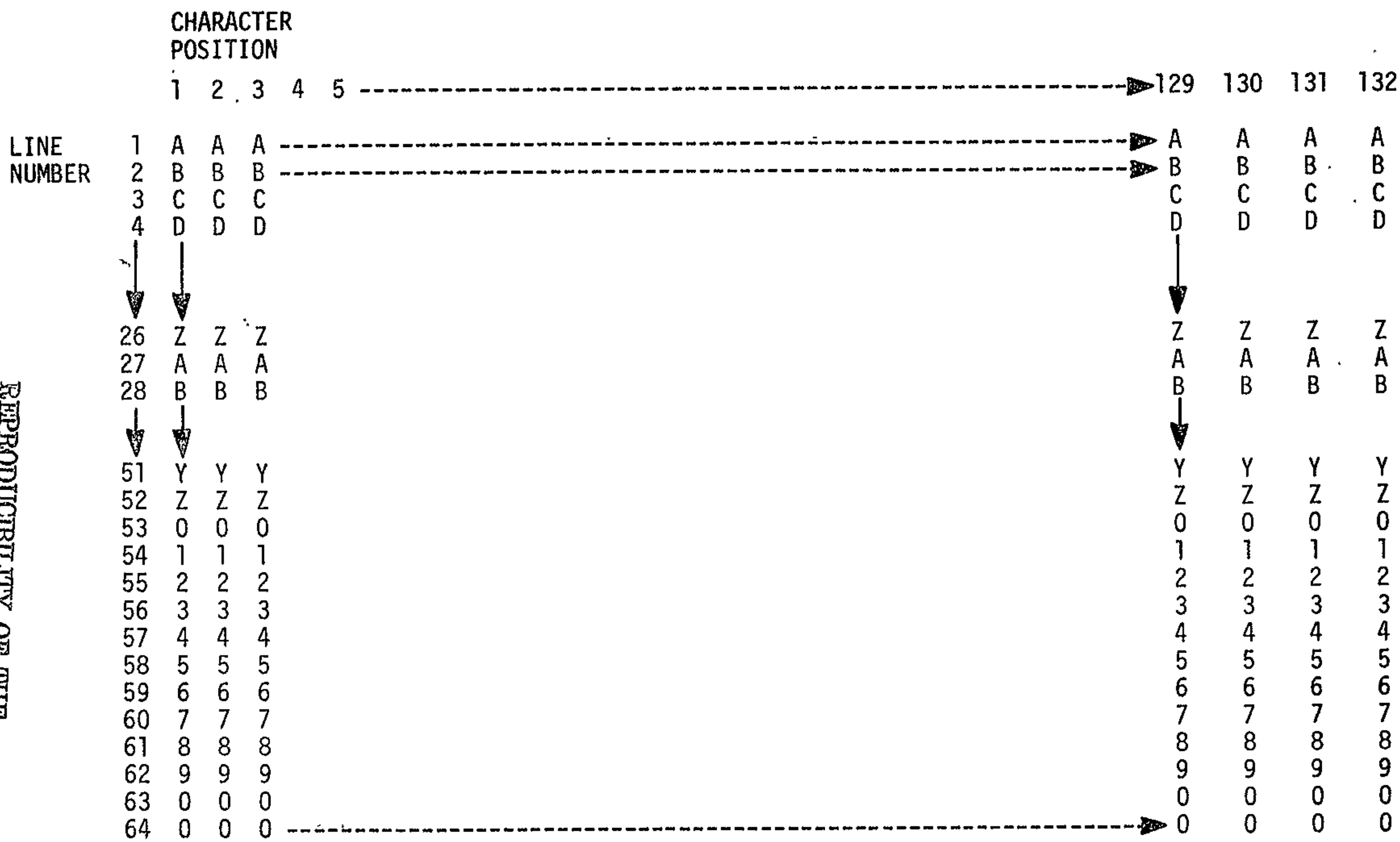
CHARACTER OVERLAY INFORMATION FOR GRAY-LEVEL TEST 3

LINE NO.	COLUMN POSITION	DATA
85	273	7
210	273	6
335	273	5
460	273	4
585	273	3
710	273	2
835	273	1
960	273	0
85	773	0
210	773	1
335	773	2
460	773	3
585	773	4
710	773	5
835	773	6
960	773	7

TABLE B-11

VECTOR OVERLAY INFORMATION FOR GRAY-LEVEL TEST 3

STARTING POINT		ENDING POINT	
LINE NO.	COLUMN POS.	LINE NO.	COLUMN POS.
23	23	23	1023
1023	23	1023	1023
23	23	1023	23
23	523	1023	523
23	1023	1023	1023
148	23	148	173
273	23	273	173
398	23	398	173
523	23	523	173
648	23	648	173
773	23	773	173
898	23	898	173
148	373	148	673
273	373	273	673
398	373	398	673
523	373	523	673
648	373	648	673
773	373	773	673
898	373	898	673
148	873	148	1023
273	873	273	1023
398	873	398	1023
523	873	523	1023
648	873	648	1023
773	873	773	1023
898	873	898	1023



NOTE: DASHED LINES AND COORDINATES NOT INCLUDED ON DISPLAY; FOR REFERENCE ONLY.

Figure B-7 Descriptor Data (64 Lines of 132 characters)

TEST PREPARATION SHEET

NASA - MANNED SPACECRAFT CENTER

Field	Entry
1. TYPE	A Configuration Change / B Non-Configuration Change
2. TPS No	E.O. 155F A12
3. S/C	Cat / No.
4. Mod Sheet Number	
5. Page	1 of 2
6. S C No /Model No	
7. Date	
8. Time	
9. Need Date	10/27/72
10. Drawings, Documents, Ocp's, & Part Number(s)	
11. Contract Number	NAS 9-1261
12. Serial Number	
13. System	Computer to Microfilm
14. Ref. E. O. Number	155F
15. TPS Short Title	Landscape Software Acceptance Test
16. Wt. Req.	

17. Reason for Work: To verify the software development on the COM System for the Landscape Software as defined in PHO-TN598 and as required under E.I. #1 of E.O. 155F. THIS IS THE FINAL TPS UNDER EO-155F.

18 DESCRIPTION (Print or Type)	21. Tech.	22 CONT	23 NASA
Refer to the attached handout for a description of the tests and test results.			
TEST PROCEDURES:			
a. At the Tape Transport:			
(1) Mount Landscape Acceptance Test Tape (Tape 3).			
b. At the Teletype:			
(1) Type GRA;LAND$J to load Landscape Program. Verify that *MONITOR is typed on the teletype.			
(2) Type UNLABELLED/↓ . Verify that *OK is typed on the teletype.			
(3) Type CLEAR/↓ [redacted] to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after [redacted] CLEAR/↓ .			

19 Prepared By: L. S. LOCKLER *L. S. Lockler*

20 Final Acceptance Date:

REFER TO PROCEDURES FOR REQUIRED SIGNATURES

Contractor	Date	NASA	Date
L. S. Lockler	10/20/72	*[signature]*	10/20/72
E. L. Moore	10/20/72	*R. E. Peter*	10/20/72

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TEST PREPARATION SHEET

CONTINUATION SHEET

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TPS No.	E.O. 155F #4A2C	
S/C	Cat.	No
Page 2 of 2		

DESCRIPTION (Print or Type)	Tech	Insp Cont.	Insp NASA
(4) Type GO/ to initiate processing of the Landscape Acceptance Test tape (Tape 3). Verify that the starting time and frame number are typed on the teletype.			
(5) Verify that elapsed job time, frame number, page number, and *END OF FILE are typed on the teletype to signal completion of data tape processing.			
(6) Type END JOB/ to complete processing of the Landscape Acceptance Test tape (Tape 3). Verify that *OK is typed on the teletype.			
(7) Type CLEAR/ twice to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/.			
(8) Type REWIND/ to rewind the Landscape Acceptance Test tape (Tape 3). Verify that *OK is typed on the teletype.			
c. At the Tape Transport:			
(1) Dismount the Landscape Acceptance Test tape (Tape 3).			
d. Test Result Verification:			
(1) Process 105mm film containing the results.			
(2) View the resulting 105mm microfiche, or have hardcopies made from the microfiche. Verify that the results match the tests described in paragraphs 1 ~~HH~~ and 2 of the attached handout.			

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B.2.3 Landscape Acceptance Test. The Landscape Acceptance Test utilizes one tape (3) containing two tests as described below and summarized in table B-12.

A. Test 1, X Shade Bars. This test shall consist of a control word, background request word, and gray shade words for 439 lines of 612 pixels each. This pattern shall demonstrate both ascending and descending shade bars and shall be constructed as illustrated in figure B-8. The first 220 lines shall be identical and consist of a descending shade pattern. The next 219 lines shall be identical and consist of an ascending shade pattern. The X shade bar overlay information shall be included in the same logical record as the gray shade words as illustrated in figure B-8 and as defined in tables B-13 and B-14. Note that overlay data coordinates are given in 1024 × 1024 matrix, but are scaled down to 612 × 439 matrix by software.

B. Test 2, Y Shade Bars. This test shall consist of a control word, background request word, and gray shade words for 439 lines of 612 pixels each. This pattern shall demonstrate both ascending and descending shade bars in the Y axis and shall be constructed as illustrated in figure B-9. The Y shade bar overlay information shall be included in the same logical record as the gray shade words as illustrated in figure B-9, and as defined in tables B-15 and B-16. Note that overlay data coordinates are given in 1024 × 1024 matrix but are scaled down to 612 × 439 matrix by software.

TABLE B-12

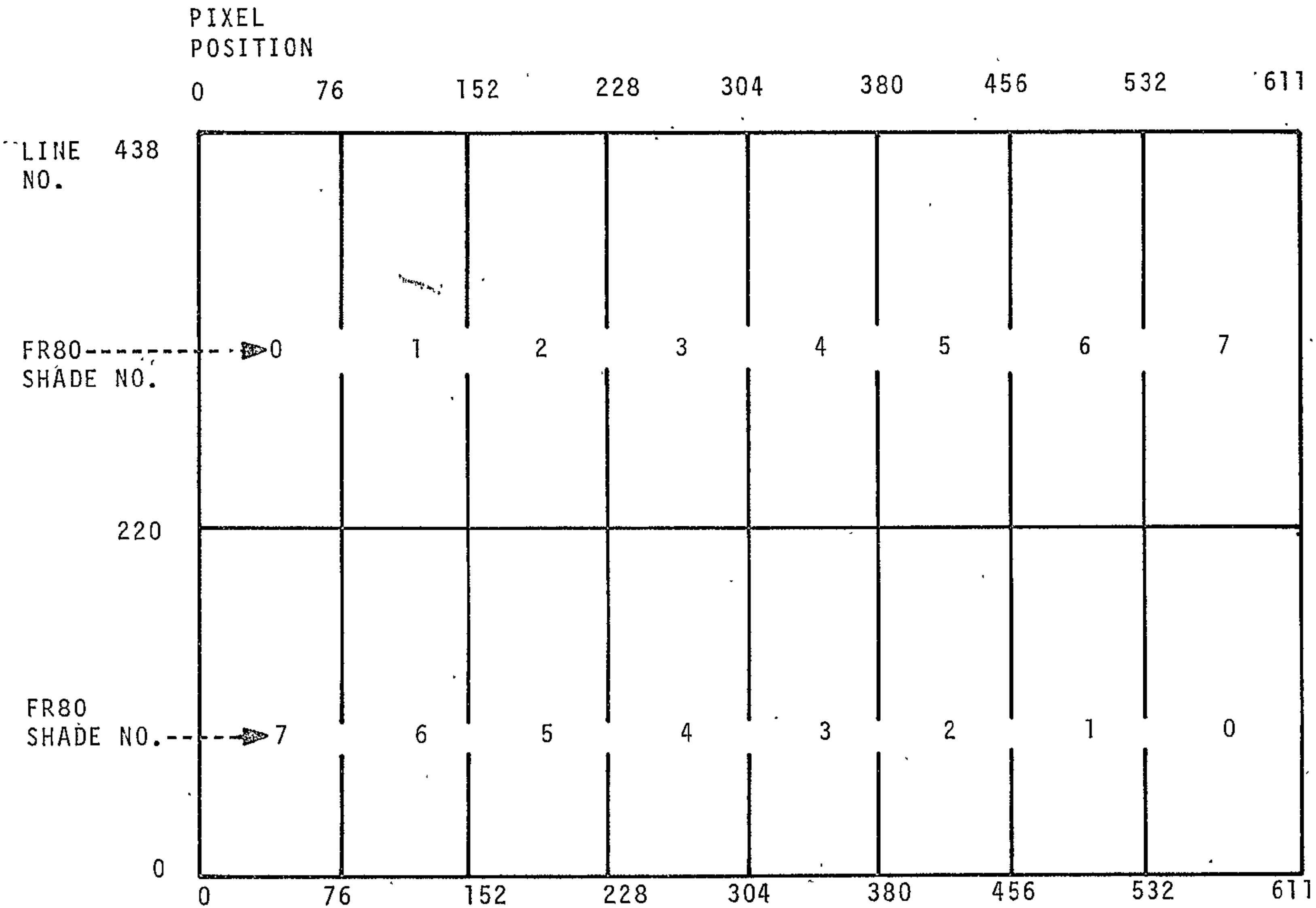
LANDSCAPE TESTS

TEST NO.	PURPOSE	CONTENT/FORMAT
1	TEST ASCENDING AND DESCENDING SHADE BARS IN X-AXIS	SPANNED VARIABLE LENGTH RECORD TO CHECK EIGHT GRAY LEVELS. TEST DISPLAY FOR THIS RECORD DEFINED IN PARA B.2.3,A.
2	TEST ASCENDING AND DESCENDING SHADE BARS IN Y-AXIS	SPANNED VARIABLE LENGTH RECORD TO CHECK EIGHT GRAY LEVELS. TEST DISPLAY FOR THIS RECORD DEFINED IN PARA B.2.3,B.

TABLE B-13

CHARACTER OVERLAY INFORMATION FOR LANDSCAPE TEST 1

LINE NO.	PIXEL POS	DATA
769	63	0
769	190	1
769	318	2
769	445	3
769	572	4
769	699	5
769	826	6
769	957	7
256	63	7
256	190	6
256	318	5
256	445	4
256	572	3
256	699	2
256	826	1
256	957	0



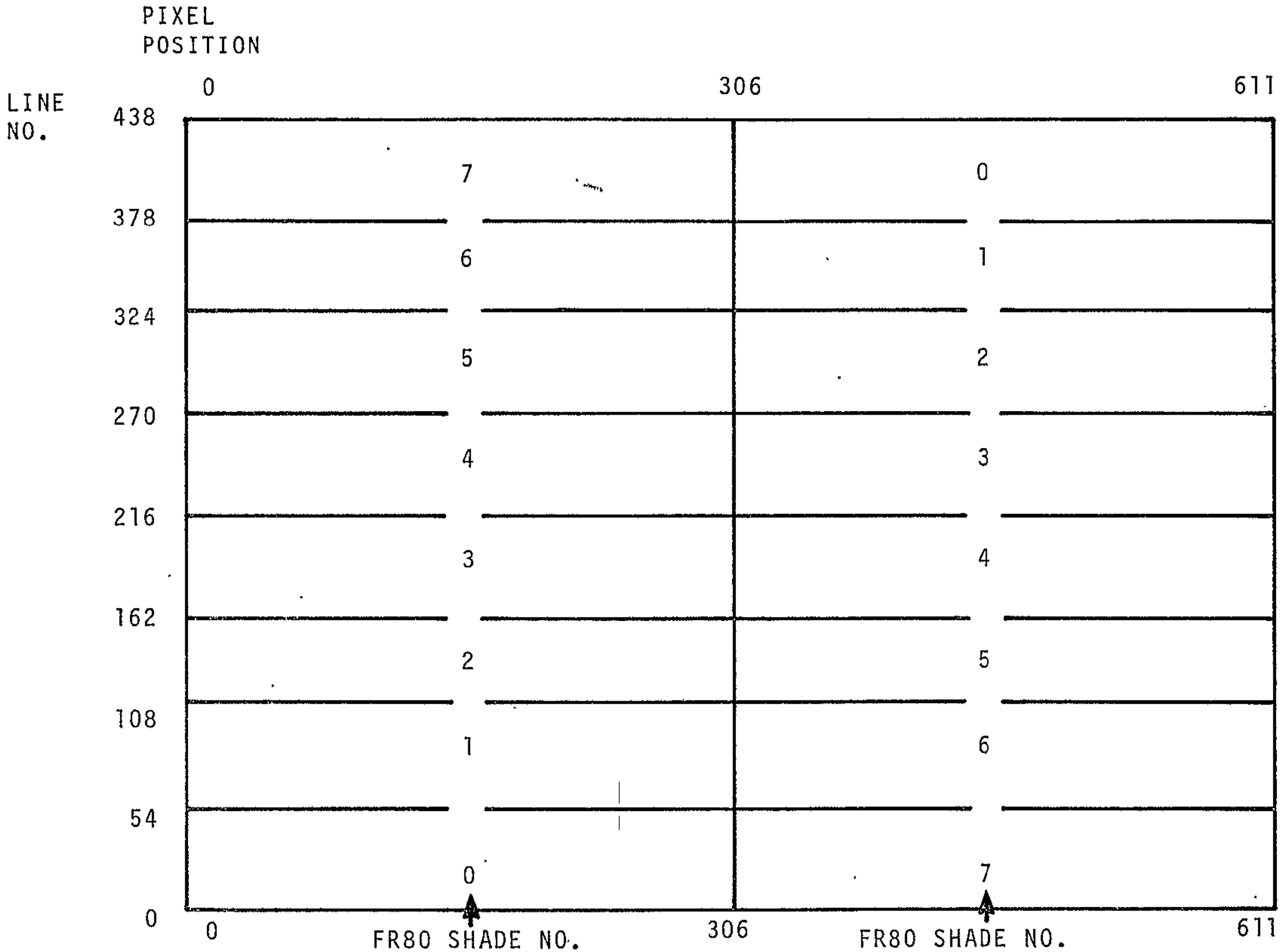
NOTE: DASHED LINES AND COORDINATES NOT INCLUDED ON DISPLAY; FOR REFERENCE ONLY.

Figure B-8 X Shade Bars and Overlay for Landscape

TABLE B-14

VECTOR OVERLAY INFORMATION FOR LANDSCAPE TEST 1

STARTING POINT		ENDING POINT	
LINE NO.	PIXEL POS	LINE NO.	PIXEL POS
1023	0	1023	1023
513	0	513	1023
0	0	0	1023
1023	0	0	0
1023	1023	0	1023
1023	127	853	127
1023	254	853	254
1023	381	853	381
1023	508	853	508
1023	635	853	635
1023	763	853	763
1023	890	853	890
683	127	343	127
683	254	343	254
683	381	343	381
683	508	343	508
683	635	343	635
683	763	343	763
683	890	343	890
170	127	0	127
170	254	0	254
170	381	0	381
170	508	0	508
170	635	0	635
170	763	0	763
170	890	0	890



NOTE: DASHED LINES AND COORDINATES ARE FOR REFERENCE ONLY; NOT INCLUDED ON DISPLAY

Figure B-9 Y Shade Bars and Overlay for Landscape

TABLE B-15

CHARACTER OVERLAY INFORMATION FOR LANDSCAPE TEST2

LINE NO.	PIXEL POS	DATA
954	256	7
819	256	6
692	256	5
566	256	4
441	256	3
315	256	2
189	256	1
63	256	0
954	768	0
819	768	1
692	768	2
566	768	3
441	768	4
315	768	5
189	768	6
63	768	7

TABLE B-16

VECTOR OVERLAY INFORMATION FOR LANDSCAPE TEST 2

STARTING POINT		ENDING POINT	
LINE NO.	PIXEL POS	LINE NO.	PIXEL POS
1023	0	1023	1023
2	0	0	1023
1023	0	0	0
1023	512	0	512
1023	1023	0	1023
881	0	881	170
755	0	755	170
629	0	629	170
504	0	504	170
378	0	378	170
252	0	252	170
126	0	126	170
881	341	881	682
755	341	755	682
629	341	629	682
504	341	504	682
378	341	378	682
252	341	252	682
126	341	126	682
881	853	881	1023
755	853	755	1023
629	853	629	1023
504	853	504	1023
378	853	378	1023
252	853	252	1023
126	853	126	1023

1 TYPE A Configuration Change / B Non-Configuration Change	**TEST PREPARATION SHEET** NASA - LYNDON B. JOHNSON SPACE CENTER	2 TPS No A3
4. Mod. Sheet Number		3 S/C Cat No.
		5. Page 1 of 4
6. S/C No /Model No	7. Date / 8. Time	9. Need Date
10 Drawings, Documents, Ocp's, & Part Number(s)		11. Contract Number
		12 Serial Number
13. System COMA		14 Ref. E O. Number TIRF #1699
15. TPS Short Title		16 Wt Req.

17. Reason for Work: Verification of CLAGRA Program

18. DESCRIPTION (Print or Type)	21. Tech	Insp 22 CONT	23. NASA
I TESTS			
A. Load 105mm camera. Use a leader in the take-up magazine. Install the 16mm control disk.			✓
B. At the teletype:			
1. Verify system is under DEBUG control.			✓
2. Type P$J.			✓
3. Focus the PLS according to the procedure on the inside of the camera bay door.			✓
4. Set the intensity to a value of 24 x 1.			✓
5. Enter space on TTY to return to DEBUG control.			✓
6. Enter GRA;GRAY$J on TTY.			✓
7. Verify that *MONITOR is typed by program.			✓
8. Enter CLEAR/(CR) on TTY. Verify that *OK is typed.			✓
9. Enter CLEAR/(CR) on TTY. Verify that *OK is typed.			✓

19. Prepared By		20. Final Acceptance Date	
REFER TO PROCEDURES FOR REQUIRED SIGNATURES		REFER TO PROCEDURES FOR REQUIRED SIGNATURES	
Contractor	Date	NASA	Date
Jed S Barnett Jr		[illegible signature]	5/14/75

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10. Mount gray level test tape #2A on 9-trk drive. Set unit select SW to 1. ________

11. Enter UNLABELLED/(CR) on TTY. Verify that *OK is typed. ________

12. Enter SKIP/(CR) to skip label on tape. Verify that *OK is typed. ________

13. Place data sw. 8 in the up position. ________

14. Enter GO/(CR) to start processing of the test tape. Verify that the start time and frame number are typed. ________

15. Verify that stop time, frame number and *END OF FILE are typed at completion of job. ________

16. Enter REWIND/(CR) to rewind test tape. Verify that *OK is typed. ________

17. Enter END JOB/(CR) to finish fiche. Verify that *OK is typed. ________

18. Dismount gray test tape and mount landscape test tape on tape drive. ________

19. Press START switch on console to get DEBUG control. ________

20. Enter LAND$J on TTY. ________

21. Same as step #7 above. ________

22. Same as step #11 above. ________

23. Same as step #14 above. ________

24. Same as step #15 above. ________

25. Same as step #16 above. ________

26. Same as step #17 above. ________

27. Dismount landscape test tape and mount class map test tape on tape drive. ________

28. Same as #19 above. ________

29. Enter CLASS$J on TTY. ______
30. Same as #7 above. ______
31. Same as #11 above. ______
32. Same as #14 above. ______
33. Same as #15 above. ______
34. Same as #16 above. ______
35. Same as #17 above. ______
36. Same as #19 above. ______
37. Enter CLAGRA$J on TTY. ______
38. Same as #7 above. ______
39. Same as #10 above. ______
40. Same as #11 above. ______
41. Same as #12 above. ______
42. Same as #14 above. ______
43. Same as #15 above. ______
44. Same as #16 above. ______
45. Same as #17 above. ______
46. Same as #18 above. ______
47. Same as #14 above. ______
48. Same as #15 above. ______
49. Same as #16 above. ______
50. Same as #17 above. ______
51. Same as #27 above. ______
52. Same as #14 above. ______

53. Same as #15 above. ______

54. Same as #16 above. ______

55. Same as #17 above. ______

56. Same as #8 above. ______

57. Same as #8 above. ______

58. Enter CNTRL D on TTY and verify that system returns to DEBUG control. ______

59. Unload camera and process film. ______

60. Save TTY scroll. ______

II VERIFICATION

1. Verify from TTY scroll that CLAGRA processed the three test tapes in less time than the old programs. ______

2. Verify that the data images from both old and new programs are the same. ______

B.3 COMA VARIAN 73 PRINT PROCESSOR FOR 16 mm FILM (VAR16)

See paragraph 2.3. Revisions are as follows:

Date	Author	TPS No.
15 November 1974	B. S. Miller	Original TPS A4

TPS No. A4 follows.

1. TYPE: A Configuration Change / B Non-Configuration Change; Mod. Sheet Number	**TEST PREPARATION SHEET** NASA - MANNED SPACECRAFT CENTER	2. TPS No. A4	3 S/C Cat. No.
		5 Page 1 of 4	
6. S/C No./Model No	7. Date	8. Time	9. Need Date
10. Drawings, Documents, Ocp's, & Part Number(s)		11. Contract Number NAS 9-1261	
		12. Serial Number	
13. System COM(A)		14 Ref E O Number MIF TASK A15	
15. TPS Short Title Acceptance test for the VARIAN 73 16mm PRINT PROCESSOR		16. Wt Req	
17. Reason for Work:			

18. DESCRIPTION (Print or Type)	21 Tech.	Insp 22 CONT	23 NASA
1. Tapes 1 and 1A will be used to test:			✓
(1) 7- or 9-track tape processing			
(2) Multi-job real			
(3) NONE, VORTEX, and TERMINAL carriage controls			
(4) Absence of COM control records			
(5) Variable page lengths			
(6) Variable record lengths			
(7) Character repertoire			
1.1 Verify that the system is under DEBUG control.			✓
1.2 Mount Tapes 1 and 1A on the 7- and 9-track drives respectively. Set switches to 1 and 2 respectively.			✓
1.3 At the teletype:			
a. Type VAR16$J to load the program and pass control to the MONITOR. Verify that *MONITOR is printed and the command list is displayed on the CRT.			✓
b. Type TAPE TYPE/8 ↓. Verify the *OK is printed.			✓
c. Type CARRIAGE CONTROLS/1 ↓. Verify that *OK is printed.			✓✓

19 Prepared By		20 Final Acceptance Date	
REFER TO PROCEDURES FOR REQUIRED SIGNATURES		REFER TO PROCEDURES FOR REQUIRED SIGNATURES	
Contractor	Date	NASA	Date
Beverly Miller	11/15/74	Freddie Jones	11/15/74

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TPS No. A4

S/C | Cat. | No.

Page 2 of 4

DESCRIPTION (Print or Type)	Tech.	Insp. Cont.	Insp. NASA
d. Type LINE PER PAGE/50 ↲. Verify that *OK is printed.			✓
e. Type GO/ ↲. Verify that the start time and frame number are printed.			✓
f. Verify that the message ENTER TAPE NUMBER: is printed.			✓
g. Type 7NONE for 7-track; 9NONE for 9-track.			✓
h. Verify that the job-time elapsed, frame number, and the messages *END OF FILE1and*FILES DONE are printed and that control is returned to the monitor.			✓
i. Type LINES PER PAGE/60 ↲. Verify that *OK is printed.			✓
j. Type CARRIAGE CONTROLS/3 ↲. Verify that *OK is printed.			✓
k. Type GO/ ↲. Verify that the start time and frame number are printed.			✓
l. Verify that "ENTER TAPE NUMBER:" is printed. Type 7TERM for 7-track; 9TERM for 9-track.			✓
m. Verify that the job time elapsed, frame number and *END OF FILE2 and*FILES DONE are printed.			✓
n. Type CARRIAGE CONTROLS/2 ↲. Verify that *OK is printed.			✓
o. Type GO/,2 ↲. Verify that the start time and frame number are printed.			✓
p. Verify that ENTER TAPE NUMBER: is printed. Type 7VRTX for 7-track; 9VRTX for 9-track.			✓
q. Verify that the job time elapsed, frame number, and END OF FILE3 is printed.			✓
q': Verify that the start time and frame number are printed			✓
r. Verify that the job time elapsed, frame number, and ***DOUBLE END OF FILE are printed.		g	✓
r': Type REWIND/4. Verify that *OK is printed			✓
s. Type USE/2 ↲. Verify that *OK is printed.			✓
t. Type TAPE TYPE/9 ↲. Verify that *OK is printed.			✓
u. Repeat the above starting with step 3C.			

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TEST PREPARATION SHEET CONTINUATION SHEET NASA — LYNDON B. JOHNSON SPACE CENTER	TPS No. A4		
	S/C	Cat.	No.
	Page 3 of 4		

DESCRIPTION (Print or Type)	Tech.	Insp. Cont.	Insp. NASA

2. Tapes 2 and 2A will be used to test the following:
   (1) 7- or 9-track tape processing
   (2) Multi-job reel
   (3) NONE, TERMINAL, and VORTEX carriage controls
   (4) Job separator, titling, forms and indexing records
   (5) Variable length pages
   (6) Variable length records

2.1 Mount Tapes 2 and 2A on the 7- and 9-track tape drives, respectively. Set the unit select switches to 1 and 2, respectively.

2.2 Verify that the system is still under MONITOR control by the fact that the command list is displayed on the CRT.

2.3 At the teletype

a. Type TAPE TYPE/8 ↲. Verify the *OK is printed.
a! Type UCE/1 ↲. Verify that *OK is printed

b. Type CARRIAGE CONTROLS/2 ↲. Verify that *OK is printed.

[redacted]

c. Type GO/ ↲. Verify that the start time and frame number are printed.

d. Verify that the job time elapsed, frame number, *END OF FILE 1 and FILES DONE are printed and control returns to the MONITOR.

e. Type CARRIAGE CONTROLS/3 ↲. Verify that *OK is printed.

f. Type GO/ ↲. Verify that the start time and frame number are printed.

g. Verify that the job time elapsed, frame number, *END OF FILE 2 and FILES DONE are printed.

h. Type CARRIAGE CONTROLS/1 ↲. Verify that *OK is printed

i. Type LINES PER PAGE/55 ↲. Verify that *OK is printed.

j. Type GO/ ↲. Verify that the start time and frame number are printed.

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TPS No. A4

S/C | Cat. | No.

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	DESCRIPTION (Print or Type)	Tech.	Insp. Cont.	Insp. NASA
	k. Verify that the elapsed job time, frame number and			✓
	***DOUBLE END OF FILE are printed.		K	✓
	l. Type USE/2 ↲. Verify that *OK is printed.			
	m. Type TAPE TYPE/9 ↲. Verify that *OK is printed.			
	m! LINES PER PAGE/60↲. Verify that *OK is printed			✓
	n. Repeat the above, beginning with 2.3 b.			✓
	k' Type REWIND/↲. Verify that *OK is printed.			

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B.4 COMA VARIAN 73 PRINT PROCESSOR FOR 105 mm FICHE (VAR105)

See paragraph 2.4. Revisions are as follows:

Date	Author	TPS No.
26 November 1974	B. S. Miller	Original TPS A5

TPS No. A5 follows.

TEST PREPARATION SHEET

NASA - MANNED SPACECRAFT CENTER

1. TYPE A Configuration Change	
B Non-Configuration Change	
2. TPS No.	A 5
3. S/C	Cat. / No.
4. Mod. Sheet Number	
5 Page 1 of 4	
6. S/C No./Model No.	
7. Date	11/26/74
8. Time	
9. Need Date	
10. Drawings, Documents, Ocp's, & Part Number(s)	
11. Contract Number	NAS 9-1261
12. Serial Number	
13. System	COMA
14 Ref E O. Number	
15. TPS Short Title	A.T. Procedure for the VARIAN 73 105mm Print Processor
16. Wt Req.	

17. Reason for Work:

allow output to microfiche of 7- or 9-track print tapes created on the VARIAN 73.

	18. DESCRIPTION (Print or Type)	21. Tech.	22 CONT	23 NASA
	1. Tapes 1 and 1A will be used to test:			✓
	(1) 7- or 9-track tape processing			
	(2) Multi-job reel			
	(3) NONE, VORTEX, and TERMINAL carriage controls			
	(4) Absence of COM control records			
	(5) Variable page lengths			
	(6) Variable record lengths			
	(7) Character repertoire			
	1.1 Verify that the system is under DEBUG control.			✓
	1.2 Mount Tapes 1 and 1A on the 7- and 9-track drives respectively. Set switches to 1 and 2 respectively.			✓
	1.3 At the teletype:			✓
	a. Type ~~[illegible]~~ VAR105$J to load the program and pass control to the MONITOR. Verify that *MONITOR is printed and the command list is displayed on the CRT.			✓

19 Prepared By

20 Final Acceptance Date

REFER TO PROCEDURES FOR REQUIRED SIGNATURES		REFER TO PROCEDURES FOR REQUIRED SIGNATURES	
Contractor	Date	NASA	Date
Beverly Miller	11/26/74	Fred Jones	11/26/74

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NASA – LYNDON B. JOHNSON SPACE CENTER

TPS No.	A5	
S/C	Cat.	No.
Page 2 of 4		

	DESCRIPTION (Print or Type)	Tech.	Insp. Cont.	Insp. NASA
b.	Type TAPE TYPE/8↲. Verify the *OK is printed.			✓
c.	Type CARRIAGE CONTROLS/1↲. Verify that *OK is printed.			✓✓
d.	Type LINE PER PAGE/50↲. Verify that *OK is printed.			✓✓
e.	Type GO/↲. Verify that the start time and frame number are printed.			✓✓
f.	Verify that the message ENTER TAPE NUMBER: is printed.			✓✓
g.	Type 7NONE for 7-track; 9NONE for 9-track.			✓✓
h.	Verify that the job-time elapsed, frame number, and the messages *END OF FILE1 and *FILES DONE are printed and that control is returned to the monitor.			✓✓
i.	Type LINES PER PAGE/60↲. Verify that *OK is printed.			✓✓
j.	Type CARRIAGE CONTROLS/3↲. Verify that *OK is printed			✓✓
k.	Type GO/↲. Verify that the start time and frame number are printed.			✓✓
l.	Verify that "ENTER TAPE NUMBER:" is printed. Type 7TERM for 7-track; 9TERM for 9-track.			✓✓
m.	Verify that the job time elapsed, frame number and *END OF FILE2 and *FILES DONE are printed.			✓✓
n.	Type CARRIAGE CONTROLS/2↲. Verify that *OK is printed.			✓✓
o.	Type GO/,2↲. Verify that the start time and frame number are printed.			✓✓
p.	Verify that ENTER TAPE NUMBER: is printed. Type 7VRTX for 7-track; 9VRTX for 9-track.			✓✓

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TEST PREPARATION SHEET CONTINUATION SHEET NASA – LYNDON B. JOHNSON SPACE CENTER	TPS No. A5		
	S/C	Cat.	No.
	Page 3 of 4		

	DESCRIPTION (Print or Type)	Tech.	Insp. Cont.	Insp. NASA
	q. Verify that the job time elapsed, frame number, and END OF FILE3 is printed.			✓✓
	r. Verify that the start time and frame number are printed.			✓✓
	s. Verify that the job time elapsed, frame number, and ***DOUBLE END OF FILE are printed.			✓✓
	t. Type REWIND/↵. Verify that *OK is printed.			✓✓
	u. Type USE/2↵. Verify that *OK is printed.			✓
	v. Type TAPE TYPE/9↵. Verify that *OK is printed.			✓
	w. Repeat the above starting with step 3C.			
	2. Tape 2 and 2A will be used to test the following:			
	(1) 7- or 9-track tape processing			
	(2) Multi-job reel			
	(3) NONE, TERMINAL, AND VORTEX Carriage controls			
	(4) Job separator, titling, forms and indexing records			
	(5) Variable length pages			
	(6) Variable length records			
	2.1 Mount Tapes 2 and 2A on the 7- and 9-track tape drives, respectively. Set the unit select switches to 1 and 2, respectively.			✓
	2.2 Verify that the system is still under MONITOR control by the fact that the command list is displayed on the CRT.			✓
	2.3 At the teletype			
	(a) Type TAPE TYPE/8↵. Verify the *OK is printed			✓
	(b) Type USE/1↵. Verify that *OK is printed.			✓
	(c) Type CARRIAGE CONTROLS/2↵. Verify that *OK is printed.			✓✓

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TPS No. A5

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	DESCRIPTION (Print or Type)	Tech.	Insp. Cont.	Insp. NASA
	(d) Type GO/↓ . Verify that the start time and frame number are printed.			√√
	(e) Verify that the job time elapsed, frame number, *END OF FILE 1 and FILES DONE are printed and control returns to the MONITOR.			√√
	(f) Type CARRIAGE CONTROLS/3 ↓. Verify that *OK is printed.			√√
	(g) Type GO/ ↓. Verify that the start time and frame number are printed.			√√
	(h) Verify that the job time elapsed, frame number, *END OF FILE 2 and FILES DONE are printed.			√√
	(i) Type CARRIAGE CONTROLS/1 ↓. Verify that *OK is printed.			√√
	(j) Type LINES PER PAGE/55 ↓. Verify that *OK is printed.	—		√
	(k) Type GO/↓ . Verify that the start time and frame number are printed.			√√
	(l) Verify that the elapsed job time, frame number and ***DOUBLE END OF FILE are printed.			√√
	(m) Type REWIND/↓ . Verify that *OK is printed.			√√
	(n) Type USE/2 ↓. Verify that *OK is printed.			
	(o) Type TAPE TYPE/9 ↓. Verify that *OK is printed.			√
	(p) LINES PER PAGE/60 ↓. Verify that *OK is printed.			√
	~~(q) Repeat the above, beginning with 2.3~~ √			

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B.5 COMA HCO TABULAR PROCESSOR FOR 105 mm FICHE (HCOTAB)

See paragraph 2.5. Revisions are as follows:

Date	Author	EO/TPS No.
17 June 1974	F. C. Ashton	EO-191F - TPS A6
12 July 1974	F. C. Ashton	TPS A7

TPS No. A6 and A7 follow.

1. TYPE	A	Configuration Change	TEST PREPARATION SHEET NASA - LYNDON B. JOHNSON SPACE CENTER	2. TPS No.	A6	
	B	Non-Configuration Change		3. S/C	Cat.	No.
4 Mod. Sheet Number				5 Page 1 of 4		

6. S/C No /Model No	7. Date	8 Time	9 Need Date
10. Drawings, Documents, Ocp's, & Part Number(s)			11. Contract Number NAS9-1261
			12. Serial Number
13. System COMPUTER TO MICROFILM			14 Ref E.O Number 191-F
15. TPS Short Title HCO TAB 7-Track & 9-Track CYBER 74 7116			16. Wt Req

17 Reason for Work: To verify the new version HCO will process both 7-Track and 9-Track.

	18 DESCRIPTION (Print or Type)	21. Tech.	Insp 22 CONT.	23 NASA
	Test Procedures			
	1. HCO Acceptance Test			
	a) AT the tape transports			
	1) Mount 9-Track HCO TAB tape number 2729 on the			
	9-Track unit.			
	2) Mount 7-Track HCO - TAB tape number 3181 on the			
	7-Track unit.			
	b) AT the teletype:			
	1) Type PRO; HCO TAB $J to load the production HCO.			
	Verify that *Monitor is typed on the teletype.			
	2) Type Clear twice to advance exposed film into			
	the take-up magazine. Verify that *OK is typed			
	on the teletype after each clear/ .			

19 Prepared By		20 Final Acceptance Date	
REFER TO PROCEDURES FOR REQUIRED SIGNATURES		REFER TO PROCEDURES FOR REQUIRED SIGNATURES	
Contractor	Date	NASA	Date
[illegible signature]	6/17/74	Freddie Jones	6/17/74
		[illegible signature]	

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TEST PREPARATION SHEET CONTINUATION SHEET NASA — LYNDON B. JOHNSON SPACE CENTER	TPS No. A6	S/C	Cat.	No.	Page 2 of 4

	DESCRIPTION (Print or Type)	Tech.	Insp. Cont.	Insp. NASA
	b) 3) Type FOCUS to focus the camera.			
	4) Type CNTRL I to End the Focus Pattern.			
	5) Type unlabelled/`. Verify *OK is typed on teletype.			
	6) Type GO/ to initiate processing of the 9-Track HCO Gray. Verify that the starting time and frame number are typed on the teletype.			
	7) Type End Job to complete processing of 9-Track HCO Gray Tape. Verify that *OK is typed on teletype.			
	8) Record the Elapse Run Time 35'7.4			
	F16 P 1014			
	9) Type rewind/: to rewind the 9-Track HCO Gray. Verify that *OK.			
	10) Type CNTRL D to return to debug. Verify that *OK is typed on the teletype.			
	11) Type FCA; HCOTAB $J to load new varsion on HCO TAB			
	12) Type unlabelled. Verify *OK is typed on the teletype.			
	13) Type GO/ to initiated processing of 9-Track HCO Gray tape. Verify that the starting time and frame number are typed on the teletype.			
	14) Verify that the elapsed job time, frame number, page number and *End of File are typed on the teletype to signal completion of data tape processing.			

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	DESCRIPTION (Print or Type)	Tech.	Insp. Cont.	Insp. NASA
	15) Type End Job to complete processing of 9-Track HCO Gray			
	tape. Verify that *OK is typed on the teletype.			
	16) Record the elapsed run time. 29'40.9"			
	17) Type rewind/ to rewind the 9-Track HCO TAB verify			
	that *OK is typed on the teletype.			
	18) Type CNTRL D to return to debug. Verify *Debug is			
	typed on the teletype.			
	19) Type ECA; HCO TAB $J to load the new version HCO TAB			
	program verify that *Monitor is typed on the teletype.			
	20) Type USE/2 to change 7-Track unit. Verify *OK is typed			
	on the teletype.			
	21) Type tape type/8 to change to 7-Track, 800 BPI.			
	Verify *OK is typed on the teletype.			
	22) Type unlabelled/ verify *OK is typed of the teletype.			
	23) Type GO/ to initiate processing of 7-Track HCO TAB			
	tape. Verify the starting time and frame number are typed			
	on the teletype.			
	24) Verify that the elapsed job time, frame number, page			
	number and * End of File are typed on the teletype to			
	signal completion of Data Tape processing.			
	TIME 28'59.9' F16P1014			
	25) Type end job/ to complete processing of HCO TAB Tape.			
	Verify that *OK is typed on the teletype.			
	26) Type Clear twice to advance exposed film into the			
	take-up magazine. Verify that *OK is typed on the			

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S/C	Cat.	No.
Page 4 of 4		

	DESCRIPTION (Print or Type)	Tech.	Insp. Cont.	Insp. NASA
	b) 26) teletype after each Clear.			
	27) Type rewind/_ to rewind the 7-Track HCO gray. Verify			
	that *OK is typed on the teletype.			
	28) Type CNTRL D to return to Debug verify * Debug is typed on the			
	teletype.			
	c) AT the tape transport			
	1) Dismount 9-Track HCO and 7-Track HCO tape.			
	d) Test result verification			
	1) Process 105mm film containing results.			
	2) View the resulting 105mm microfiche on the Bell &			
	Howell viewgraph.			

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1. TYPE	A Configuration Change		TEST PREPARATION SHEET NASA - LYNDON B. JOHNSON SPACE CENTER	2. TPS No. A7	
	B Non-Configuration Change			3 S/C	Cat. / No
4. Mod. Sheet Number				5. Page 1 of 2	
6 S/C No /Model No		7. Date	8. Time	9. Need Date 27 July 74	
10. Drawings, Documents, Ocp's, & Part Number(s)				11 Contract Number	
				12 Serial Number	
13. System Computer to Microfilm				14. Ref E. O Number	
15. TPS Short Title HCO Tab Title Acceptance Test				16. Wt Req.	

17. Reason for Work: To verify Title Fiche Development for HCO Tape

(FR80 CLARIFICATION FORM A17)

18 DESCRIPTION (Print or Type)	21 Tech	Insp 22 CONT.	23 NASA
TEST PROCEDURES			
1. HCO Tab Test			
a) At the 7-Track Tape Transport:			
(1) Mount Tape Number 3181.			
b) At the Teletype:			
(1) Type FCA;HCOTAB$ J TO LOAD program.			
Verify that *MONITOR is typed on the			
Teletype.			
(2) Type CLEAR/↲ to advance exposed film			
into the take-up magazine. Verify that			
*OK is typed on the Teletype.			
(3) Type UNLABELLED/↲. Verify *OK is typed			
on the Teletype.			
(4) Type TAPE TYPE 8↲. Verify *OK is typed			
on the Teletype.			
(5) Type USE2↲. Verify *OK is typed on			
the Teletype.			

19 Prepared By		20 Final Acceptance Date	
REFER TO PROCEDURES FOR REQUIRED SIGNATURES		REFER TO PROCEDURES FOR REQUIRED SIGNATURES	
Contractor	Date	NASA	Date
Franklin Carter	7/12/74	Freddie Epme	7/12/74

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NASA – LYNDON B. JOHNSON SPACE CENTER

TPS No.	A7	
S/C	Cat.	No.
Page 2 of 2		

	DESCRIPTION (Print or Type)	Tech.	Insp. Cont.	Insp. NASA
	(6) Type GO↓. Verify Time and Frame is typed on the Teletype.			
	(7) When ENTER SOURCE TAPE is typed on the Teletype, type 3299 -3181.			
	(8) When ENTER COM TAPE is typed on the Teletype, type 7-TRACK .			
	(9) When ENTER ROLL is typed on the Teletype, type HCO TAB.			
	(10) Type CNTRL A. Verify that *MONITOR is typed on the Teletype.			
	(11) Type REWIND↓. Verify that *OK is typed on the Teletype.			
	(12) Type CLEAR↓. Verify that *OK is typed on the Teletype.			
	(13) Type CLEAR↓. Verify that *OK is typed on the Teletype.			
	(14) Type CNTRL D to return to DEBUG. Verify *DEBUG is typed on the Teletype.			
	c) At the 7-Track Transport, dismount the tape.			
	d) Test Result Verification:			
	(1) Process 105mm containing results.			
	(2) View the resulting 105mm microfiche on the Bell and Howell Viewgraph.			

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B.6 COMA PDP 11/45 PRINT PROCESSOR FOR 16 mm FILM (PDP16)

See paragraph 2.6. Revisions are as follows:

Date	Author	TPS No.
21 January 1974	V. D. Pote	TPS A8

TPS No. A8 follows.

TYPE			TEST PREPARATION SHEET NASA - LYNDON B. JOHNSON SPACE CENTER	2. TPS No	A8	
A	Configuration Change			3 S/C	Cat.	No.
B	Non-Configuration Change					
4. Mod. Sheet Number				5. Page 1 of 2		
6. S/C No /Model No		7 Date	8 Time	9 Need Date		
10. Drawings, Documents, Ocp's, & Part Number(s)				11 Contract Number NAS9-1261		
				12 Serial Number		
13 System: Computer to Microfilm				14 Ref E O. Number		
15 TPS Short Title: PDP11 Tab Print Software Acceptance Test				16. Wt. Req		

17. Reason for Work: To verify the software improvement on the COM System for microfilm output of PDP11 FORTRAN generated Tab Tapes.

	18 DESCRIPTION (Print or Type)	21. Tech	Insp. 22.CONT	23. NASA
	TEST PROCEDURES			
	1. PDP11 Tab Print Acceptance Test			
	a. At the Tape Transport			✓
	(1) Mount Tab Test Tape			
	b. At the Teletype			✓
	(1) Type PRO;PDP16$J to load program.			✓
	Verify that *MONITOR is typed on the			
	teletype.			
	(2) Type CLEAR/↓ twice to advance exposed			✓
	film into take-up magazine. Verify			
	that *OK is typed on the teletype after			
	each CLEAR/↓.			
	(3) Type GO↓ to initiate processing of			✓
	the tape. Verify that the starting			
	time and frame number are typed on the			
	teletype.			
	(4) Verify that Job Separator is written on			✓
	film by monitoring the CRT.			

19. Prepared By		20 Final Acceptance Date	
REFER TO PROCEDURES FOR REQUIRED SIGNATURES		REFER TO PROCEDURES FOR REQUIRED SIGNATURES	
Contractor	Date	NASA	Date
Leonard D. Pate	1/21/74	E. E. Jones	1/21/74

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TPS No.	A8		
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Page 2 of 2			

	DESCRIPTION (Print or Type)	Tech.	Insp. Cont.	Insp. NASA
	(5) Verify that Job Separator and "ENTER TAPE NUMBER" are typed on the teletype.			✓
	(6) Enter a 7 digit number on telewriter.			✓
	(7) Enter Rub-out Key. Verify that tape number if repeated excluding the last digit.			✓
	(8) Enter ↵. Verify that tape number is written on film in eyeball size characters by monitoring the CRT. At this time, mark present time.			✓
	(9) Verify that processing is proceeding by monitoring the CRT.			✓
	(10) Watch for next job separator on film indicating the end of 1st file. Mark time.			✓
	(11) Watch for next job separator on film indicating the end of 2nd file.			✓
	(12) Stop processing with Reset Key and mark stop time.			✓
	(13) Enter CLEAR↵ twice to clear exposed film.			✓
2.	PDP11 Tab Print Older Version Restore production version of program and repeat step 1 excluding step b.(7).		✓	
3.	Develop film and verify that film from both versions is identical.		✓	
4.	Calculate manually the time savings of the new version using the timing statistics gathered. NEW 4'28" old 6'30"		✓	

B.7 COMA PDP 11/45 PRINT PROCESSOR FOR 105 mm FICHE (PDP105)

See paragraph 2.7. There are no revisions to this program.

B.8 COMA HARVARD COLLEGE OBSERVATORY SOLAR EXPERIMENT S055 GRAY-LEVEL 9-TRACK PROCESSOR (S055)

See paragraph 2.8. Revisions are as follows:

Date	Author	EO/TPS No.
28 November 1973	F. C. Ashton	Original EO-191 TPS A9

TPS A9 follows. See also paragraph B.8.1, tables B-17 and B-18 and figures B-10 through B-12.

TYPE: A Configuration Change / B Non Configuration Change	**TEST PREPARATION SHEET** NASA - MANNED SPACECRAFT CENTER	2 TPS No ~~FRS A17~~ A9
4 Mod Sheet Number		3 S C Cat No
		5 Page 1 of 3
6 S/C No / Model No	7 Date 8 Time	9 Need Date 1 December 1973
10 Drawings, Documents, Ocp's & Part Number(s)		11 Contract Number NAS9-1261
		12 Serial Number
13 System Computer to Microfilm		14 ~~Ref. E. O.~~ Number 191F
15 TPS Short Title S055 Software Acceptance Test		16 Wt Req

17 Reason for Work To verify the software improved thruput development on the COM System for the HCO as defined in PHO SH-09833 and as required under ~~PO 191F~~ FR 20 MICROFILM SYSTEM TASK A13

18 DESCRIPTION (Print or Type)	21. Tech.	22 CONT	23 NASA
TEST PROCEDURES			
1. S055 Acceptance Test - Tape 1			
a. At the Tape Transport:			
(1) Mount S055 Acceptance Test Tape 1			✓
b. At the Teletype:			
(1) Type PRO;S055 $J to load S055 Program. Verify that *MONITOR is typed on the teletype.			✓
(2) Type CLEAR/↓ twice to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/↓.			✓
(3) Type UNLABELED/↓. Verify *OK is typed on the teletype.			✓
(4) Type GO/↓ to initiate processing of S055 Acceptance Test Tape (Tape 1). Verify that the starting time and frame number are typed on the teletype.			✓

19 Prepared By	20. Final Acceptance Date
Frank Ashton	

REFER TO PROCEDURES FOR REQUIRED SIGNATURES	Date	REFER TO PROCEDURES FOR REQUIRED SIGNATURES NASA	Date
Franklin Cadd [illegible]	11/28/73	R.L. Bryant	11/28/73
[illegible]	11-28-73	E. Jones	11/28/73

NASA—MSC—Coml., Houston, Texas

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TPS No	~~[illegible]~~ A9	
S/C	Cnt	No
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	DESCRIPTION (Print or Type)	Tech.	Insp Cont	Insp NASA
	(5) Verify that the elapsed job time, frame number, page number and *END OF FILE are typed on the teletype to signal completion of data tape processing.			✓
	(6) Type END JOB/↓ to complete processing of S055 Acceptance Test Tape (Tape 1). Verify that *OK is typed on the teletype.			✓
	(7) Type CLEAR/↓ to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/↓.			✓
	(8) Type REWIND/↓ to rewind the S055 Test Tape (Tape 1). Verify that *OK is typed on the teletype.			✓
	(9) Type CNTRL D to return to DEBUG. Verify *DEBUG is typed on the teletype.			✓
	c. At the Tape Transport			
	(1) Dismount the S055 Acceptance Test Tape (Tape 1).			✓
	2. S055 Acceptance Test Tape 2			
	a. At the Tape Transport			
	(1) Mount S055 Acceptance Test Tape (Tape 2).			✓
	b. At the Teletype:			
	(1) Type PRO;S055 $J to load S055 program. Verify that *MONITOR is typed on the teletype.			✓
	(2) Type SKIP/↓ to bypass the standard label on the tape. Verify that *OK is typed on the teletype.			✓
	(3) Type UNLABELED/↓. Verify that *OK is typed on the teletype.			✓

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NASA - MANNED SPACECRAFT CENTER

TPS No	E... A9.	
S/C	Cat.	No
Page 3 of		

DESCRIPTION (Print or Type)	Tech.	Insp Cont	Insp NASA
(4) Type CLEAR/↓ to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/↓.			✓
(5) Type GO/↓ to initiate processing of S055 Acceptance Test Tape (Tape 2). Verify that the starting time and frame number are typed on the teletype.			✓
(6) Verify that the elapsed job time, frame number, and *END OF FILE are typed on the teletype to signal completion of data tape processing.			✓
(7) Type END JOB/↓ to complete processing of the S055 Acceptance Test Tape (Tape 2). Verify that *OK is typed on the teletype.			✓
(8) Type CLEAR/↓ twice to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/↓.			✓
(9) Type REWIND/↓ to rewind the S055 Acceptance Test Tape (Tape 2). Verify that *OK is typed on the teletype.			✓
c. At the Tape Transport:			
(1) Dismount the S055 Acceptance Test Tape (Tape 2).			✓
d. Test Result Verification:			
(1) Process 105 mm film containing results.			
(2) View the resulting 105 mm microfiche on the Bell & Howell viewgraph. Verify that the results match Test 1 as described in Paragraph 1 of the accompaning handout and Test 2 and Test 3 as described in Paragraphs 2 and 3.			

MSC FORM 1225A (JUL 65)

COPY 1

FRSO MICROFILM SYSTEM TASK

PURPOSE	AFFECTED DOCUMENTS	MISSION NO.	REV NO.
[✓] NEW REQUIREMENT [ ] REVISION [ ] CLARIFICATION [ ] OTHER	[✓] TR-531 [ ] OTHER		

ORIGINATOR	OFFICE	NAME	DATE
J. Conlan	Harvard U.	F. E. Jones 11/2/73	

SUBJECT:

Modifications to the S055 Gray Level and Tab Programs

REFERENCE:

TEXT:

The Principal Investigators have requested that several changes be incorporated into the S055 Gray Level and tab programs.

PHO is requested to implement the following changes:

Gray Level

1. Rotate images 90 degrees counterclockwise.

2. Change format to be 7 rows by 12 or more columns.

3. Change the "title" record to accomodate new title information. The new title information will be defined later.

4. Shift every other scan line (2, 4, 6, etc.) a fraction of a pixel. The fraction wil be defined later. The characters on the right may be dropped.

5. Provide the capability to accept a control word to skip a data frame position on film.

S055 Tabs

Implement the capability to handle the S055 tabs formatted in the DTE language The output will be on Fiche.

INSTRUCTIONS

1. All FMST's shall be routed through DSS secretary for assignment of control number.

2. Subject is the function to be changed or clarified.

3. Text shall be included in area provided or on attached sheets.

DSS APPROVAL	SER APPROVAL	PHO APPROVAL
SIGNATURE Cornelius J. Sullivan	SIGNATURE Samuel D. Sanborn	SIGNATURE J. L. Benson
DATE Oct 15, 1973	DATE 11/20/73	DATE 11/28/73

MSC Form 757 (Oct 72) NASA — MSC

B.8.1 Test 1, 64 Shade Frames. This test shall be contained on tape 1 and shall consist of header data and gray-level data to build 64 images of 60 lines of 120 pixels per image. This will demonstrate maximum image size, multiple images per fiche, multiple fiche per job, and all possible shades of gray. Header data shall consist of three lines per frame, each line containing 132 alphanumerics. Gray-level data shall be constructed as illustrated in figure B-10 and table B-17. Each image will be a unique gray-level as defined in figure B-10.

B.8.2 Test 2, 64 X-Shade Bars. This test and test 3 shall be contained on tape 2. This test shall consist of header data and gray-level data to build four frames of 60 lines of 120 pixels per image. This pattern will demonstrate ascending shade bars in the X-axis. Header data shall consist of three lines per frame, each line containing 132 alphanumerics. Gray-level data shall be constructed as illustrated in figure B-11 and table B-17. Each image will consist of 16 unique gray-levels as defined in figure B-11.

B.8.3 Test 3, Every Fourth Shade X-Bars. This test shall consist of header data and gray-level data to build four frames of 60 lines of 120 pixels per image. This pattern will test contrast levels between every fourth gray-level. Header data shall consist of three lines per frame, each line containing 132 alphanumerics. Gray-level data shall be constructed as illustrated in figure B-12 and table B-17. Each image will consist of 16 unique gray-levels as defined in figure B-12.

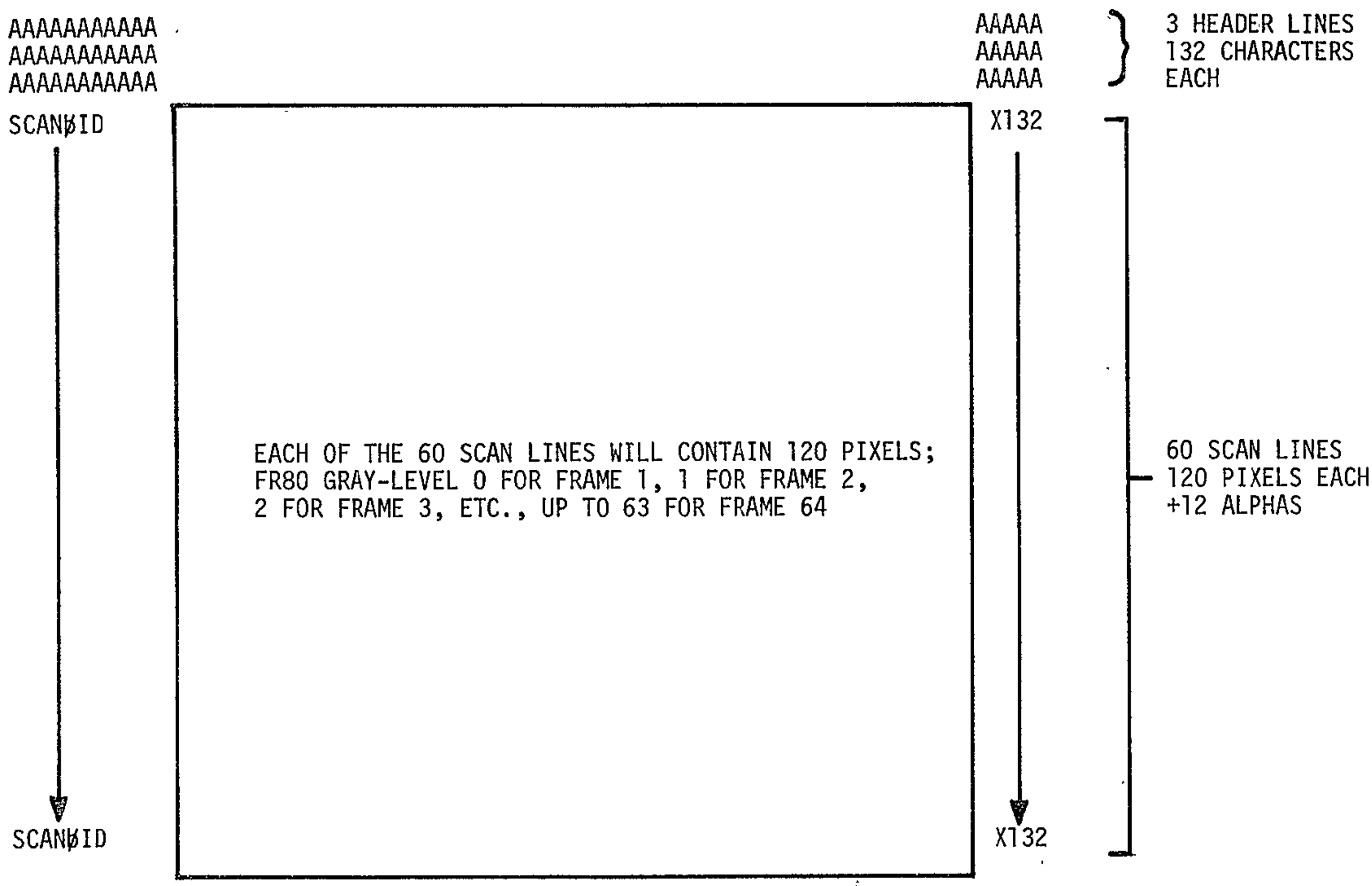
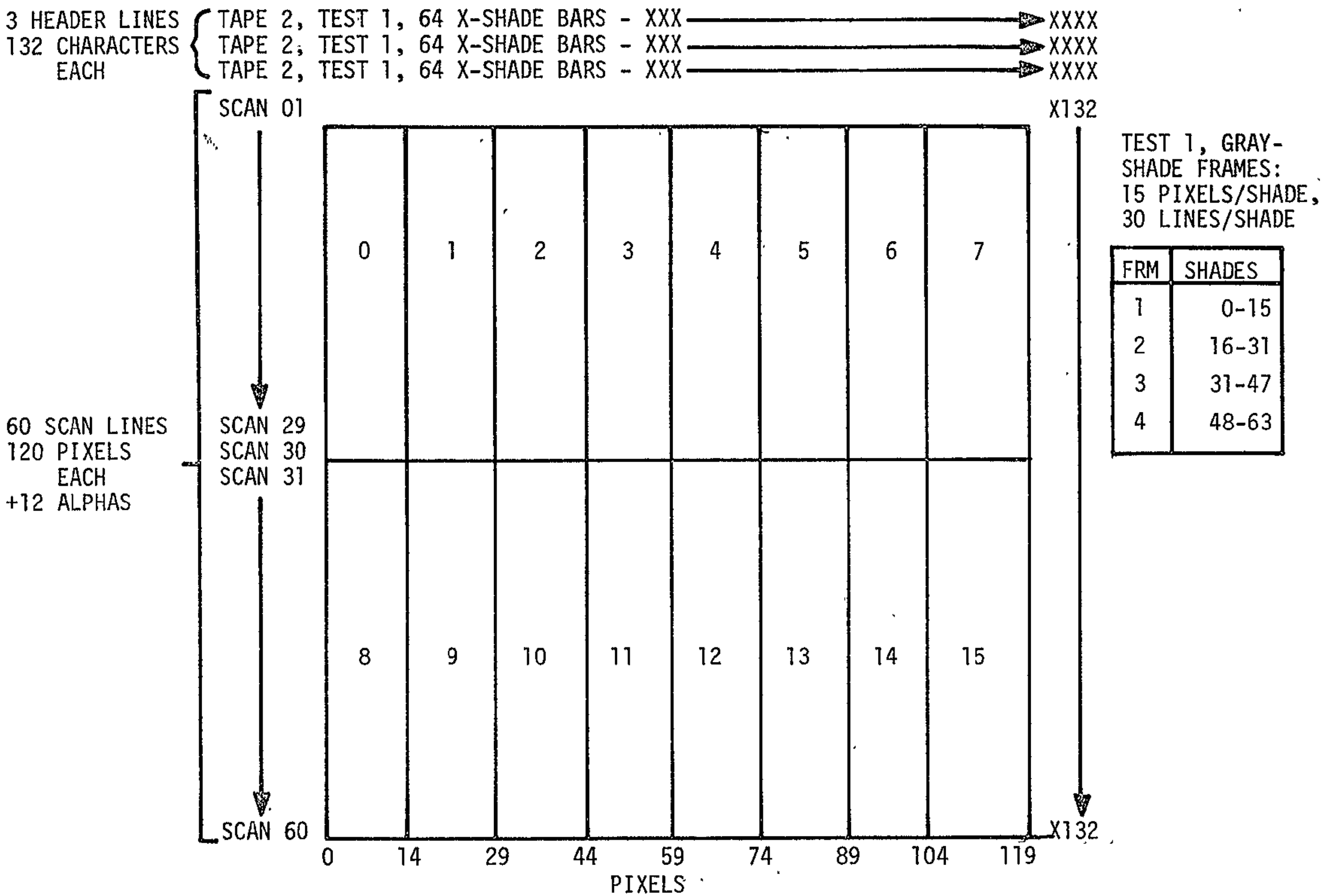


Figure B-10 Test 1, Gray-Level Frame

TABLE B-17

S055 GRAY-LEVEL TESTS

TEST/TAPE NO.	PURPOSE	CONTENT/FORMAT
1/1	TEST MAXIMUM IMAGE SIZE, MULTIPLE IMAGES PER FICHE, MULTIPLE FICHE PER JOB, AND 64 SHADES OF GRAY	THREE HEADER RECORDS AND 60 GRAY-LEVEL RECORDS PER FRAME, 64 FRAMES, IN FIXED-LENGTH RECORDS. BLOCKED AT 1320 BYTES PER BLOCK. TEST DISPLAYS FOR THE ABOVE MENTIONED RECORDS ARE DEFINED IN PARA B.8.1
2/2	TEST 64 ASCENDING X-SHADE BARS. FOUR FRAMES, 16 SHADES PER FRAME	THREE HEADER RECORDS AND 60 GRAY-LEVEL RECORDS PER FRAME, FOUR FRAMES, IN FIXED-LENGTH RECORDS BLOCKED AT 1320 BYTES PER BLOCK. TEST DISPLAYS FOR THE ABOVE MENTIONED RECORDS ARE DEFINED IN PARA B.8.2
3/2	COMPARE CONTRASTS BETWEEN EVERY FOURTH GRAY-LEVEL IN ASCENDING X-SHADE BARS	THREE HEADER RECORDS AND 60 GRAY-LEVEL RECORDS PER FRAME, FOUR FRAMES, IN FIXED-LENGTH RECORDS BLOCKED AT 1320 BYTES PER BLOCK. TEST DISPLAYS FOR THE ABOVE MENTIONED RECORDS ARE DEFINED IN PARA B.8.3



FRM	SHADES
1	0-15
2	16-31
3	31-47
4	48-63

Figure B-11 Test 2, X-Shade Bars

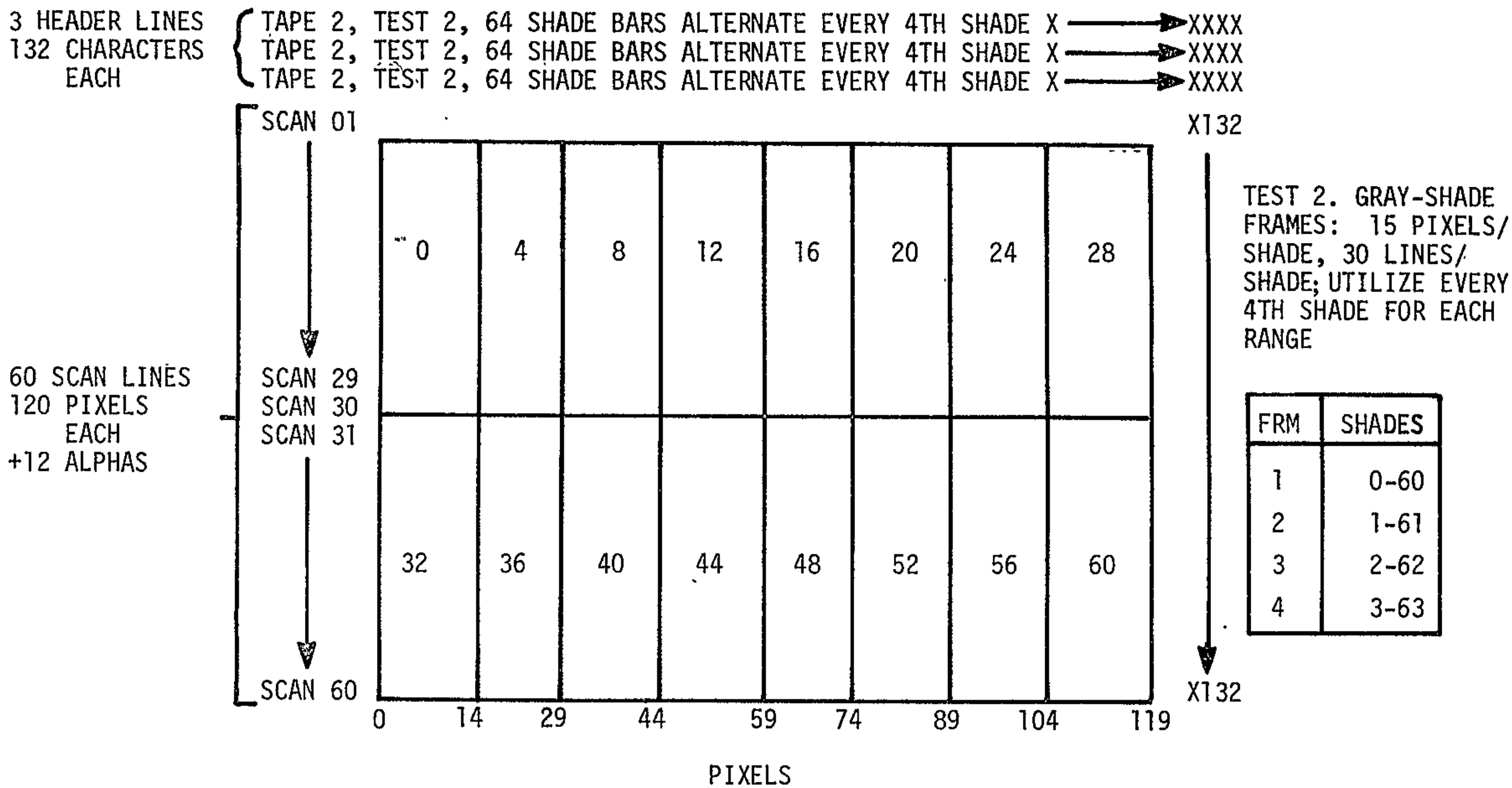


Figure B-12 Test 3, Every Fourth Shade X-Bars

TABLE B-18

USER FICHE TITLES

TAPE NO.	TITLE
1	SKYLAB SOLAR EXPERIMENT S055 TEST TAPE NO. 1 TEST 1 -- 64 FRAMES, UNIQUE GRAY-LEVEL PER FRAME
2	SKYLAB SOLAR EXPERIMENT S055 TEST TAPE NO. 2 TEST 1 AND TEST 2 X-SHADE BARS

B.9 COMA IBM SYSOUT PRINT PROCESSOR (105PR, 16 PRNT)

See paragraph 2.9. Revisions are as follows.

Date	Author	TPS No.
10 September 1974	F. C. Ashton	TPS A10
10 September 1974	F. C. Ashton	TPS A11
22 October 1975	J. S. Bennett	TPS A21

TPS No. A10, A11 and A21 follow.

1. TYPE: A Configuration Change / B Non-Configuration Change	TEST PREPARATION SHEET NASA - MANNED SPACECRAFT CENTER	2. TPS No	A 10	
4. Mod. Sheet Number		3. S/C	Cat.	No.
		5 Page 1 of 4		
6. S/C No./Model No	7 Date	8 Time	9 Need Date	
10. Drawings, Documents, Ocp's, & Part Number(s)			11. Contract Number	
			12 Serial Number	
13 System COM-A			14 Ref. E. O. Number	
15. TPS Short Title 12K Print Programs - 105mm Camera			16 Wt. Req.	

17. Reason for Work:

Installing the new 12K Print Program for 105 mm Camera 105PR

	18 DESCRIPTION (Print or Type)	21. Tech	Insp 22 CONT	23 NASA
	INTRODUCTION			
	The new 12K Print Program will be tested against			
	the old Print Program. The new program is			
	MON:105NAS; the old program is PRO;105PR.			
	1) At the Tape Transport mount Test Tape 2.			
	2) At the Teletype, type MON;105NAS$J to load			
	the new 105 Print Program.			
	3) At the Teletype, type FOCUS/7,0,1⤶ to focus			
	the system.			
	4) At the Teletype, type UNLABELED. Verify that			
	*OK is printed on the Teletype.			
	5) At the Teletype, type SKIP/⤶. To skip dummy			
	label verify that *OK is printed out on			
	Teletype.			
	6) At the Teletype, type GO/⤶. Verify that time			
	and frame is printed out on the Teletype.			

19. Prepared By		20 Final Acceptance Date	
REFER TO PROCEDURES FOR REQUIRED SIGNATURES		REFER TO PROCEDURES FOR REQUIRED SIGNATURES	
Contractor	Date	NASA	Date
Franklin C. Watts	9/10/74	E. Jones	9/4/74

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TEST PREPARATION SHEET CONTINUATION SHEET NASA – LYNDON B. JOHNSON SPACE CENTER	TPS No. A10 S/C	Cat.	No.
	Page 2 of 4		

	DESCRIPTION (Print or Type)	Tech.	Insp. Cont.	NAS
	7) When END OF FILE is printed out on the Teletype,			
	type END OF JOB.			
	8) Record the time and frame.			
	TIME 19'33.4 FRAME 70 PAGE 1470			
	9) At the Teletype, type REWIND/ↁ to rewind Tape.			
	10) At the Teletype, type FRAME/0ↁ to reset			
	frame count.			
	11) At the Tape Transport			
	A) Dismount Tape 2.			
	B) Mount Tape 2A.			
	12) At Teletype, type SKIP/ↁ. Verify that *OK			
	is printed out on the Teletype.			
	13) At the Teletype, type GO/ↁ. Verify that			
	time is printed out on the Teletype.			
	14) When END OF FILE is printed out on the Teletype,			
	type END OF JOB.			
	15) At the Teletype, type REWIND/ↁ to rewind to the			
	tape.			
	16) Record the time, frame, page.			
	TIME 5'6.1 FRAME 1 PAGE 208			
	17) At the Transport			
	A) Dismount Tape 2A			
	B) Mount Tape 6			
	18) At the Teletype, type FRAME/0ↁ to reset			
	frame count.			
	19) At the Teletype, type STANDARD LABELS/ↁ to			
	set check standard label.			
	20) At the Teletype, type GO/ↁ. Verify that time			
	is printed out on the Teletype.			
	21) Record time, frame and page when END OF FILE			
	is printed out.			
	TIME 6'36.1 FRAME 7 PAGE 803			

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TEST PREPARATION SHEET

CONTINUATION SHEET

NASA – LYNDON B. JOHNSON SPACE CENTER

TPS No. A10

S/C | Cat. | No.

Page 3 of 4

DESCRIPTION (Print or Type)	Tech.	Insp. Cont.	Insp. NASA
22) At the Teletype, type REWIND to rewind the tape.			
23) At the Tape Transport			
A) Dismount Tape 6.			
B) Mount Tape 2.			
24) At the Teletype, type CNTRL D to enter DEBUG.			
25) At the Teletype, type PRO;105PR$J to load the old 105mm Print Program.			
26) At the Teletype, type UNLABEL/↓.			
27) At the Teletype, type SKIP/↓.			
28) At the Teletype, type GO/↓. Verify that time is printed out on the Teletype.			
29) When END OF FILE is printed out of the Teletype, type in END JOB.			
30) Record time, frame, page.			
TIME 1820 FRAME 69 PAGE 1449			
31) At the Teletype, type REWIND/↓ to rewind Tape.			
32) At the Teletype, type FRAME/0↓ to reset frame count.			
33) At the Tape Transport			
A) Dismount Tape 2.			
B) Mount Tape 2A.			
34) At the Teletype, type GO/↓. Verify that time is printed out on the Teletype.			
35) When END OF FILE is printed out, type END JOB.			
36) Record the time, frame, page.			
TIME 1.9 FRAME 1 PAGE 208			
37) At the Teletype, type REWIND/↓ to rewind the tape.			
38) At the Teletype, type FRAME/0↓ to reset frame count.			

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REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

TEST PREPARATION SHEET CONTINUATION SHEET NASA – LYNDON B. JOHNSON SPACE CENTER	TPS No. A 10		
	S/C	Cat.	No.
	Page 4 of 4		

	DESCRIPTION (Print or Type)	Tech.	Insp. Cont.	Insp. NASA
	39) At the Teletype, type STANDARD LABEL to check			
	Standard Label Record.			
	40) At the Tape Transport			
	A) Dismount Tape 2A.			
	B) Mount Tape 6.			
	41) At the Teletype, type GO/↓. Verify that time			
	is printed out on the Teletype.			
	42) When END OF FILE is printed out on the Teletype,			
	record time, frame and page.			
	TIME 6:24" FRAME 7 PAGE 800			
	43) At the Teletype, type REWIND/↓ to rewind the			
	tape.			
	44) At the Teletype, type two CLEAR/↓ to clear			
	film in the camera.			
	45) Process the film.			

JSC FORM 1225A (JUL 65)

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TYPE A Configuration Change / B Non-Configuration Change	**TEST PREPARATION SHEET** NASA - MANNED SPACECRAFT CENTER		2 TPS No. A 11	
4. Mod. Sheet Number			3 S/C Cat. No.	5 Page 1 of 3
6. S/C No /Model No	7. Date	8. Time	9. Need Date	
10 Drawings, Documents, Ocp's, & Part Number(s)			11. Contract Number	
			12 Serial Number	
13 System COM-A			14 Ref. E. O. Number	
15 TPS Short Title 12K PRINT PROGRAMS - 16MM CAMERA (16PRNT)			16. Wt. Req	
17. Reason for Work: Installing the new 12K Print Program for 16mm camera				

	18 DESCRIPTION (Print or Type)	21. Tech	22 CONT	23 NASA
	INTRODUCTION:			
	The new 12K Print Program will be tested against the old Print Program. The new program is MON:NEW16; the old program is PRO:16PRNT.			
	1) At the Tape Transport mount the Test Tape 1.			
	2) At the Teletype, type MON:NEW15$J to load the new 16mm Print Program.			
	3) At the Teletype, type FOCUS/7,0,1 to focus the system.			
	4) At the Teletype, type GO/1. Verify that time, frame and JOB ID is printed out on the Teletype.			
	5) When *END OF JOB and *END OF FILE is printed out on the Teletype, record the time and frame count.			
	TIME 9'23.3 FRAME 59			

19 Prepared By		20 Final Acceptance Date	
REFER TO PROCEDURES FOR REQUIRED SIGNATURES		REFER TO PROCEDURES FOR REQUIRED SIGNATURES	
Contractor	Date	NASA	Date
[signature]	9/10/74	[signature]	9/10/74

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TEST PREPARATION SHEET CONTINUATION SHEET NASA - MANNED SPACECRAFT CENTER	TPS No A11	
	S/C	Cat / No
	Page 2 of 3	

	DESCRIPTION (Print or Type)	Tech	Insp Cont	Insp NASA
	6) At the Teletype, type REWIND/↲ to rewind			
	the tape.			
	7) At the Teletype, type FRAME/0↲ to reset the			
	frame count.			
	8) At the Tape Transport			
	A) Dismount Test Tape 1			
	B) Mount Test Tape 1A			
	9) At the Teletype, type GO/↲. Verify that time,			
	frame and Job ID is printed out on the Teletype.			
	10) When *END OF JOB and *END OF FILE is printed			
	out on the Teletype, record the time and frame			
	count.			
	TIME 1487 FRAME 170			
	11) At the Teletype, type REWIND/↲ to rewind the			
	tape.			
	12) At the Tape Transport.			
	A) Dismount Tape 1A			
	B) Mount Tape 1			
	13) At the Teletype, type CLEAR/↲.			
	14) At the Teletype, type CNTRL to enter DEBUG.			
	15) At the Teletype, type PRO:16PRNT$J.			
	16) At the Teletype, type GO/↲. Verify that time,			
	frame, and Job ID is printed out on the Teletype.			
	17) When *END OF JOB and *END OF FILE is printed out			
	on the Teletype, record the time and frame count.			
	TIME 9265 FRAME 358			
	18) At the Teletype, type REWIND/ to rewind the			
	tape.			
	19) At the Teletype, type FRAME/0↲ to reset			
	frame count.			
	20) At the Tape Transport			
	A) Dismount Test Tape 1			
	B) Mount Test Tape 1A			

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COPY 1

TEST PREPARATION SHEET CONTINUATION SHEET NASA - MANNED SPACECRAFT CENTER	TPS No	A11	
	S/C	Cat.	No
	Page 3 of 3		

	DESCRIPTION (Print or Type)	Tech	Insp Cont.	Insp NASA
	21) At the Teletype, type GO/↲. Verify that time,			
	frame and Job ID is printed out on the Teletype.			
	22) When *END OF JOB and *END OF FILE is printed out			
	on the Teletype, record the time and frame count.			
	TIME 1'46.2 FRAME 170			
	23) At the Teletype, type REWIND/↲ to rewind the			
	tape.			
	24) Process the film.			

MSC FORM 1225A (JUL 65) COPY 1

1. TYPE	A Configuration Change	TEST PREPARATION SHEET	2 TPS No	A21
	B Non-Configuration Change.	NASA - LYNDON B. JOHNSON SPACE CENTER	3 S/C	Cat / No.
4 Mod Sheet Number			5. Page 1 of 3	
6. S/C No /Model No	7. Date 10/22/75	8. Time	9. Need Date	
10. Drawings, Documents, Ocp's, & Part Number(s)			11 Contract Number	
			12 Serial Number	
13 System COMA			14 Ref E. O Number TIRF 5235	
15 TPS Short Title			16. Wt Req	

17. Reason for Work Verification of Fiche Print Program (105PR) index form and index flash modifications.

	18 DESCRIPTION (Print or Type)	21. Tech	22 CONT	23 NASA
	I. TESTS			
	A. Load the 105mm camera. Use a leader in the take up magazine.			✓
	B. At the teletype:			
	1. Verify that the system is under DEBUG control.			✓
	2. Enter P$J			✓
	3. Focus the PLS according to the procedure on the inside of the camera bay door.			✓
	4. Enter a space on the TTY to return to DEBUG control.			✓
	5. Enter 105PR$J on the TTY.			✓
	6. Verify that *MONITOR is typed by the program.			✓
	7. Enter CLEAR/(CR) on the TTY. Verify that *OK is typed.			✓
	8. Enter CLEAR/(CR) on the TTY. Verify that *OK is typed.			✓

19. Prepared By		20 Final Acceptance Date	
REFER TO PROCEDURES FOR REQUIRED SIGNATURES		REFER TO PROCEDURES FOR REQUIRED SIGNATURES	
Contractor	Date	NASA	Date
Jack G. Bennett Jr	10/22/75	E. E. Jones	10/22/75

JSC FORM 1225 (JUL 65)

COPY 1

9. Place data switch 8 in the up position.

10. Mount COM test tape #D2 on the 9-TRK drive. Set the unit select switch to #1.

11. Enter GO/(CR) to start processing of the test tape. Verify that the start time and frame number are typed.

12. Verify that the stop time, frame number, and *END OF FILE are typed at completion of job.

13. Enter REWIND/(CR) to rewind test tape. Verify that *OK is typed.

14. Return the system to DEBUG control.

15. Dismount test tape #D2 and mount test tape #12762 on the 9-TRK drive.

16. Enter 105PR on the TTY.

17. Verify that *MONITOR is typed by the program.

18. Enter GO/(CR) to start processing of the test tape. Verify that the start time and frame number are typed.

19. Verify that the stop time, frame number, and *END OF FILE are typed at completion of job.

20. Enter REWIND/(CR) to rewind test tape. Verify that *OK is typed.

21. Enter CLEAR/(CR) on the TTY. Verify that *OK is typed.

22. Enter CLEAR/(CR) on the TTY. Verify that *OK is typed.

23. Return the system to DEBUG control.

24. Process 105mm film.

25. Save TTY scroll.

II. Verification

A. Verify that the entries in the index page are listed sequentially down the page rather than across. ✓

B. Verify that there are no multiple entries for any one page. ✓

B.10 COMA HARVARD COLLEGE OBSERVATORY SOLAR EXPERIMENT S055 GRAY-LEVEL 7-TRACK OR 9-TRACK PROCESSOR (HCO)

See paragraph 2.10. Revisions are as follows:

Date	Author	EO/TPS No.
28 November 1973	F. C. Ashton	EO-191F - TPS A12
17 June 1974	F. C. Ashton	EO-191F - TPS A13
12 July 1974	F. C. Ashton	TPS A14

TPS No. A12, A13 and A14 follow.

1 TYPE: A Configuration Change; B Non Configuration Change	**TEST PREPARATION SHEET** NASA - MANNED SPACECRAFT CENTER	2. TPS No FKSC ~~413~~ A/2
4 Mod Sheet Number		3 S/C — Cat — No
		5 Page 1 of 3
6 S/C No /Model No.	7. Date — 8 Time	9. Need Date 1 December 73
10 Drawings, Documents, Ocp's, & Part Number(s) /		11 Contract Number NAS9-1261
		12. Serial Number
13 System Computer to Microfilm		14. Ref E O Number 191F
15 TPS Short Title HCO Software Acceptance Test		16 Wt Req

17 Reason for Work To verify the software development on the COM System for the HCO as defined in PHO SH-25722 and as required under ~~EO 191F~~ FR 80 MICROFILM SYSTEM TASK .413

18. DESCRIPTION (Print or Type)	21. Tech	22 CONT	23 NASA
TEST PROCEDURES			
1. HCO Acceptance Test - Tape 2			
a. At the Tape Transport:			
(1) Mount S055 Acceptance Test Tape 2			
b. At the Teletype:			
(1) Type PRO;HCO $J to load HCO Program. Verify that *MONITOR is typed on the teletype.			
(2) Type CLEAR/↓ twice to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/↓.			
(3) Type UNLABELED/↓. Verify *OK is typed on the teletype.			
(4) Type SKIP/↓ to bypass the standard label on the tape. Verify that *OK is typed on the teletype.			

19 Prepared By		20 Final Acceptance Date	
REFER TO PROCEDURES FOR REQUIRED SIGNATURES		REFER TO PROCEDURES FOR REQUIRED SIGNATURES	
Contractor	Date	NASA	Date
Raymond C. Oakley [signature]	11/28/73	R L Bryant [signature]	11/28/73
[signature]	11-28-73	[signature]	11/28/73

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TEST PREPARATION SHEET
CONTINUATION SHEET
NASA - MANNED SPACECRAFT CENTER

TPS No	~~ERG-113~~ B12	
S/C	Cat	No
Page 2 of 3		

	DESCRIPTION (Print or Type)	Tech	Insp Cont	Insp NASA
	(5) Type GO/↵ to initiate processing of S055 Acceptance Test Tape (Tape 1). Verify that the starting time and frame number are typed on the teletype.			
	(6) Verify that the elapsed job time, frame number, page number and *END OF FILE are typed on the teletype to signal completion of data tape processing.			
	(7) Type END JOB/↵ to complete processing of S055 Acceptance Test Tape (Tape 1). Verify that *OK is typed on the teletype.			
	(8) Type CLEAR/↵ to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/↵.			
	(9) Type REWIND/↵ to rewind the S055 Test Tape (Tape 1). Verify that *OK is typed on the teletype.			
	(10) Type CNTRL D to return to DEBUG. Verify *DEBUG is typed on the teletype.			
	c. At the Tape Transport			
	(1) Dismount the S055 Acceptance Test Tape (Tape 2).			
	2. S055 Acceptance Test Tape 2			
	a. At the Tape Transport			
	(1) Mount HCO Acceptance Test Tape (Tape 3).			
	b. At the Teletype:			
	(1) Type PRO;HCO $J to load S055 program. Verify that *MONITOR is typed on the teletype.			
	(2) Type UNLABELED/↵. Verify that *OK is typed on the teletype.			

MSC FORM 1275A (JUL 65)

COPY 1

TEST PREPARATION SHEET
CONTINUATION SHEET
NASA - MANNED SPACECRAFT CENTER

TPS No ~~[illegible]~~ A12
S/C | Cat | No
Page 3 of 3.

DESCRIPTION (Print or Type) | Tech. | Insp Cont | NASA

(3) Type CLEAR/↓ to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/↓.

(4) Type GO/↓ to initiate processing of S055 Acceptance Test Tape (Tape 2). Verify that the starting time and frame number are typed on the teletype.

(5) Verify that the elapsed job time, frame number, and *END OF FILE are typed on the teletype to signal completion of data tape processing.

(6) Type END JOB/↓ to complete processing of the HCO Acceptance Test Tape (Tape 3). Verify that *OK is typed on the teletype.

(7) Type CLEAR/↓ twice to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/↓.

(8) Type REWIND/↓ to rewind the S055 Acceptance Test Tape (Tape 2). Verify that *OK is typed on the teletype.

c. At the Tape Transport:

(1) Dismount the HCO Acceptance Test Tape (Tape 3).

MSC FORM 1215A (JUL 65) COPY 1

1 TYPE	A	Configuration Change		TEST PREPARATION SHEET	2 TPS No	A 13	
	B	Non-Configuration Change		NASA - LYNDON B. JOHNSON SPACE CENTER	3 S/C	Cat.	No.
4 Mod. Sheet Number					5 Page 1 of 4		
6 S/C No./Model No				7 Date / 8 Time	9 Need Date		
10 Drawings, Documents, Ocp's, & Part Number(s)					11. Contract Number NAS9-1261		
					12 Serial Number		
13 System Computer To Microfilm					14 Ref E. O Number 191-F		
15 TPS Short Title HCO Gray 7-Track and 9-Track					16 Wt Req		

17 Reason for Work: To verify the new version HCO will process both 7-Track and 9-Track

	18 DESCRIPTION (Print or Type)	21 Tech	Insp 22 CONT	23 NASA
	Test Procedures			
	1. HCO Acceptance Test			
	a) AT the tape transports			
	1) Mount 9-Track HCO in Gray tape			
	number 3165 on the 9-Track unit.			
	2) Mount 7-Track HCO - Gray			
	Tape number 3299 on the 7-Track unit.			
	b) At the teletype:			
	1) Type PRO; HCO $J to load the production			
	HCO. Verify that * Monitor is typed on the			
	teletype.			
	b) 2) Type CLEAR twice to advance exposed film into the			
	take-up magazine. Verify that * OK is type on the			
	teletype after each CLEAR			
	3) Type Focus to Focus the Camera.			

19 Prepared By		20 Final Acceptance Date	
REFER TO PROCEDURES FOR REQUIRED SIGNATURES		REFER TO PROCEDURES FOR REQUIRED SIGNATURES	
Contractor	Date	NASA	Date
[signature]	6/17/74	Frederick E. Jones	6/17/74

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	DESCRIPTION (Print or Type)	Tech.	Insp. Cont.	Insp. NASA
	4) Type CNTRL I to end the focus pattern.			
	5) Type unlabelled 12. Verify *OK is type on Teletype.			
	6) Type GO to initiate processing of the 9-Track HCO Gray. Verify that the starting time and frame number are typed on the teletype.			
	7) Type End Job to complete processing of 9-Track HCO Gray tape. Verify that *OK is type on teletype.			
	8) Record the Elapse Run Time. 35'7.4			
	F16 P1014			
	9) Type rewind/) to rewind the 9-Track HCO Gray. Verify that *OK.			
	10) Type CNTRL D to return to Debug. Verify that *OK is typed on the teletype.			
	11) Type FCA; HCO $ J to load new version on HCO Gray.			
	12) Type unlabelled. Verify * OK is typed on the teletype.			
	13) Type GO/) to initiate processing of 9-Track HCO Gray tape. Verify that the starting time and frame number are typed on the teletype.			
	14) Verify that the elapsed job time, frame number, page number and * End of File are typed on the teletype to signal completion of data tape processing.			
	15) Type end job to complete processing of 9-Track HCO Gray tape. Verify that *OK is typed on the teletype.			

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	DESCRIPTION (Print or Type)	Tech.	Insp. Cont.	Insp. NASA
	b) 16) Record the Elapsed Run Time 29'40.9".			
	F16 P 1014			
	17) Type rewind/) to rewind the 9-Track HCO Gray Verify that *OK is typed on the teletype.			
	18) Type CNTRL D to return to Debug. Verify *DEBUG is typed on the teletype.			
	19) Type FCA; HCO $J to load the new version HCO Gray program verify that *Monitor is typed on the teletype.			
	20) Type USE/2. to Change 7-Track unit. Verify *OK is typed on the teletype.			
	21) Type Tape Type/8 to change to 7-Track, 800 BPI. Verify *OK is typed on the teletype.			
	22) Type Unlabelled/ verify *OK is type of the teletype.			
	23) Type GO/ to initiate processing of 7-Track HCO Gray tape. Verify the starting time and frame number are typed on the teletype.			
	24) Verify that the elapsed job time, frame number, page number and *End of File are typed on the teletype to signal completion of data tape processing.			
	25) Type end job/ to complete processing of HCO gray tape. Verify that *OK is typed on the teletype.			
	TIME 28'59 F16 P1014			
	26) Type Clear twice to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each Clear.			

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TEST PREPARATION SHEET CONTINUATION SHEET NASA — LYNDON B. JOHNSON SPACE CENTER	TPS No. A13		
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	DESCRIPTION (Print or Type)	Tech.	Insp. Cont.	Insp. NASA
	b) 27) Type rewind/ to rewind the 7-Track HCO Gray. Verify			
	that *OK is typed on the teletype.			
	28) Type CNTRL D to return to Debug. Verify *Debug is			
	typed on the teletype.			
	c) AT the tape transport			
	1) Dismount 9-Track HCO and 7-Track HCO tape.			
	d) Test result verification			
	1) Process 105mm Film containing results.			
	2) View the resulting 105mm microfiche on the Bell &			
	Howell viewgraph.			

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1. TYPE: A Configuration Change / B Non-Configuration Change	**TEST PREPARATION SHEET** NASA - LYNDON B. JOHNSON SPACE CENTER	2 TPS No. A 14	
4. Mod. Sheet Number		3 S/C Cat. No	
		5 Page 1 of 2	
6 S/C No /Model No	7 Date / 8. Time	9 Need Date 27 July 74	
10 Drawings, Documents, Ocp's, & Part Number(s)		11 Contract Number	
		12. Serial Number	
13 System: Computer to Microfilm		14 Ref E O. Number	
15. TPS Short Title: HCO Gray Title Acceptance Test		16. Wt Req.	
17 Reason for Work: To verify that Title Fiche Development for HCO Gray (FR80 Clarification Form A17)			

18 DESCRIPTION (Print or Type)	21 Tech.	Insp. 22 CONT	23. NASA
TEST PROCEDURES			
1. HCO Gray Test			
a) At the 7-Track Tape Transport:			
(1) Mount Tape Number 3299			
b) At the Teletype:			
(1) Type FCA;HCO$J to load HCO program. Verify that *MONITOR is typed on the Teletype.			
(2) Type CLEAR/↓ to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype.			
(3) Type UNLABELLED/↓. Verify *OK is typed on the Teletype.			
(4) Type TAPE TYPE 8↓. Verify *OK is typed on the Teletype.			
(5) Type USE 2↓. Verify *OK is typed on the Teletype.			

19 Prepared By: Frank Ashton	20 Final Acceptance Date
REFER TO PROCEDURES FOR REQUIRED SIGNATURES	REFER TO PROCEDURES FOR REQUIRED SIGNATURES

Contractor	Date	NASA	Date
Frank Ashton	7/12/74	Freddie E Jones	7/12/74

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TEST PREPARATION SHEET CONTINUATION SHEET NASA – LYNDON B. JOHNSON SPACE CENTER	TPS No. A14 S/C Cat. No. Page 2 of 2			
	DESCRIPTION (Print or Type)	**Tech.**	**Insp. Cont.**	**Insp. NASA**
	(6) Type GO↲ Verify Time and Frame is typed on the Teletype.			
	(7) When ENTER SOURCE TAPE is typed on the Teletype, type 3299↲.			
	(8) When ENTER COM TAPE is typed on the Teletype, type 7-TRACK .			
	(9) When ENTER ROLL is typed on the Teletype, type HCO GRAY.			
	(10) Type CNTRL A. Verify that *MONITOR is typed on the Teletype.			
	(11) Type REWIND↲. Verify that *OK is typed on the Teletype.			
	(12) Type CLEAR↲. Verify that *OK is typed on the Teletype.			
	(13) Type CLEAR↲. Verify that *OK is typed on the Teletype.			
	(14) Type CNTRL D to return to DEBUG. Verify *DEBUG is typed on the Teletype.			
	c) At the 7-Track Transport, dismount the tape.			
	d) Test Result Verification:			
	(1) Process 105mm film containing results.			
	(2) View the resulting 105mm microfiche on the Bell and Howell Viewgraph.			

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B.11 COMA UNIVAC 494 PRINT PROCESSOR FOR 105 mm FICHE (94U105)

See paragraph 2.11. Revisions are as follows:

Date	Author	EO/TPS No.
6 November 1973	I. J. Morgan	EO-204F - TPS A17

TPS A17 follows. See also paragraphs B.11.1 through B.11.5, figure B-13, and tables B19 and B-20.

1. TYPE: A Configuration Change / B Non Configuration Change	TEST PREPARATION SHEET NASA - MANNED SPACECRAFT CENTER	2. TPS No.	E.O. 204F A17
4. Mod. Sheet Number		3. S/C	Cat. / No.
		5 Page 1 of 3	
6. S/C No /Model No	7 Date / 8 Time	9 Need Date 6-11-73	
10. Drawings, Documents, Ocp's, & Part Number(s)		11. Contract Number NAS 9-1261	
		12 Serial Number	
13. System COMPUTER ON MICROFILM		14. Ref. E O. Number 204F EI#1	
15. TPS Short Title UNIVAC 494 SOFTWARE ACCEPTANCE TEST FOR THE 105mm FILM		16. Wt Req.	

17. Reason for Work: To verify the software development on the COM System for the Univac 494 Print Processor as defined in PHO SH-09846 and as required under E.O. 204F.

18. DESCRIPTION (Print or Type)	21. Tech	Insp 22 CONT	Insp 23 NASA
TEST PROCEDURES			
1. Univac 494 Print Processor Acceptance Test - Tape 1			
a. At the Tape Transport (7-track unit)			
(1) Mount Univac 494 Acceptance Test Tape 1.			
b. At the Teletype:			
(1) Type PRO;UNIVAC$J to load the Univac 494 105mm program. Verify that *Monitor is typed on the teletype.			
(2) Type CLEAR/↵ twice to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/↵ .			
(3) Type GO/↵ to initiate processing of Univac 494 Acceptance Test Tape (Tape 1). Verify that the starting time and frame number are typed on the teletype.			

19. Prepared By L. LOCKLER *L. Lockler*	20 Final Acceptance Date
REFER TO PROCEDURES FOR REQUIRED SIGNATURES	REFER TO PROCEDURES FOR REQUIRED SIGNATURES

Contractor	Date	NASA	Date

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TEST PREPARATION SHEET CONTINUATION SHEET NASA - MANNED SPACECRAFT CENTER	TPS No	E.O. 204F A/7	
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	DESCRIPTION (Print or Type)	Tech	Insp Cont.	Insp NASA
	1. (4) Verify that the elapsed job time, frame number, page number and *END OF FILE are typed on the teletype to signal completion of data tape processing.	✓		
	(5) Type REWIND/↲ to rewind the Univac Test Tape (Tape 1). Verify that *OK is typed on the teletype.	✓		
	c. At the Tape Transport			
	(1) Dismount the Univac 494 Print Acceptance Test Tape (Tape 1).	✓		
	2. Univac 494 Print Acceptance Test Tape 2 (continuation of Job 2 from Tape 1)	✓		
	a. At the Tape Transport:	✓		
	(1) Mount the Univac 494 Test Tape 2.			
	b. At the Teletype:			
	(1) Type CONTINUE/↲ to signify continuation of Job.			
	(2) Verify that the elapsed job time, frame number, page number and *END OF FILE are typed on the teletype to signal completion of data tape processing.			
	(3) Type END JOB/↲ to complete processing of the Univac 494 Test Tape (Tape 2).			
	(4) Type CLEAR/↲ twice to advance exposed film into the take-up magazines. Verify that *OK is typed on the teletype after each CLEAR/↲ .	✓		
	(5) Type REWIND/↲ to rewind the Univac 494 Print Acceptance Test Tape (Tape 2). Verify that *OK is typed ~~OK~~ on the teletype			

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CONTINUATION SHEET

NASA - MANNED SPACECRAFT CENTER

TPS No.	E.O. 204F A17	
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	DESCRIPTION (Print or Type)	Tech	Insp Cont.	Insp NASA
	2. c. At the Tape Transport:			
	(1) Dismount the Univac 494 Print Acceptance			
	Test Tape (Tape 2).			
	d. Test Result Verification:			
	(1) Process 105mm film containing results.			
	(2) View the resulting 105mm microfiche on the			
	Bell & Howell viewgraph. Verify that the			
	results match the Jobs as described in the			
	following paragraphs.			

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B.11.1 Job 1, Multifiche Test. This job shall be contained in its entirety on tape 1. It shall consist of the proper job separation and titling control records and shall contain data to build in excess of 207 full pages (64 lines of 132 alphanumeric characters each). Data pages shall be constructed as illustrated in figure B-13 with the first and second pages of that figure alternating. A control record for forms overlay and indexing shall precede every set of 64 data records. This job will demonstrate maximum page size, multiple pages per fiche, multiple fiches per job (two), complete character repertoire, the five forms, and variable indexing. See table B-19.

B.11.2 Job 2, Multireel Test. This job shall begin on tape 1 and continue to tape 2. A job separator control record shall separate jobs 1 and 2. Sixteen hundred physical blocks of data, to produce full pages as illustrated in figure B-13, shall be generated. Only 382 physical blocks of this data shall be placed on tape 1, followed by Univac's Standard End-of-File, as defined in Univac's 494 Uniservo VIII C Magnetic Tape Subsystem. The remaining data shall be on tape 2. A control record for forms overlay and indexing shall precede every set of 64 data records. The form number and indexing values (as specified for job 1) shall vary from one record to another. Job 2 shall demonstrate the COMA's ability to handle multireel per job and multireel per page. See table B-19.

B.11.3 Job 3, Carriage Control Test. A job separator control record shall separate jobs 2 and 3; shall be followed by a title control record and 1024 logical records of data. The data pages shall be constructed as illustrated in figure B-13. The line spacing count (byte 135_{10}) of every 32nd data record will contain a number 32_{10} or greater. This shall cause 32 lines of data to appear on each page (frame). The line spacing count on all other records of data shall contain a zero; i.e., the data in the next record shall be printed on the next line. A forms and index control record shall not be present. This job shall show COMA's ability to properly process the line spacing count, and its ability to handle the absences of an index frame for the 105 mm film. See table B-19.

B.11.4 Job 4, Comic Mode Test. A job separator record, title control record, form and indexing control record, and an image orientation control record shall precede the data records. The image orientation control record shall indicate COMIC mode; i.e. a 1 shall follow the 1 as specified in the *Computer Output Microfilm System A UNIVAC 494 Print Processing Requirements Specification*. The data records shall be constructed to produce three full pages of data. The forms control record shall be set to a 4 without indexing. This job shall test COMA's ability to generate the COMIC mode. See table B-19.

B.11.5 Job 5, Cine Mode Test. A job separator record, title control record, forms and indexing control record, and an image orientation control record shall precede the data records. The image orientation control record shall indicate CINE mode; i.e., a 2 shall follow the 1 as specified in the *Computer Output Microfilm System A UNIVAC 494 Print Processing Requirements Specification*. The data records shall be constructed to produce a pattern as illustrated in figure B-13. One hundred ninety-two logical records of data shall be generated to produce three full pages of data. The forms record shall be set to a 4 without indexing. This data shall be followed by an end-of-file, end-of-tape control record. This job illustrates COMA's ability to handle the CINE mode and to recognize the end-of-file, end-of-tape as the last job to be processed from this tape. The end-of-file, end-of-tape control record shall be followed by Univac's standard end-of-file as defined in Univac's 494 Uniservo VIII C Magnetic Tape Subsystem. See table B-19.

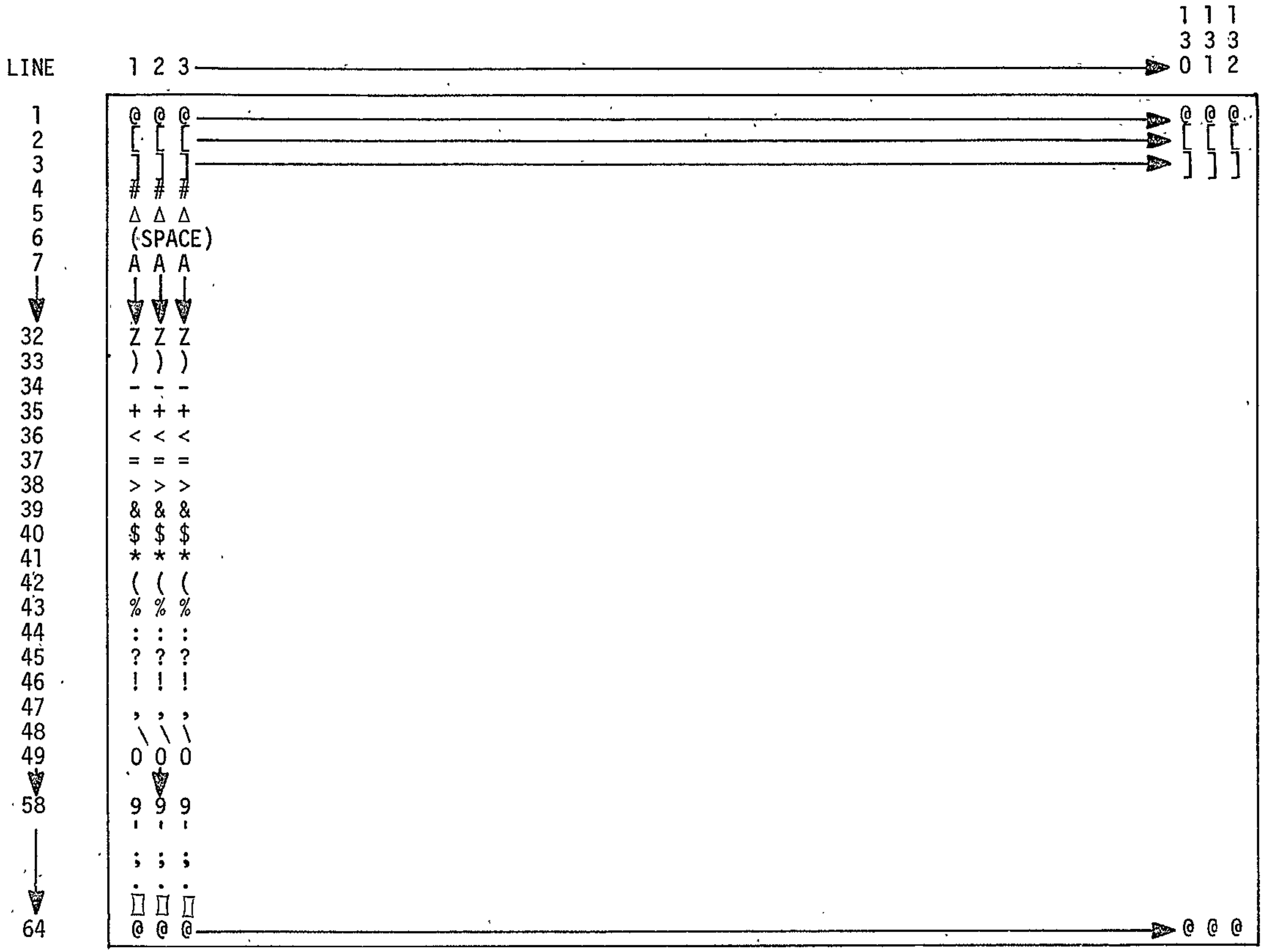

Figure B-13 Alphanumeric Data (64 Lines of 132 characters)

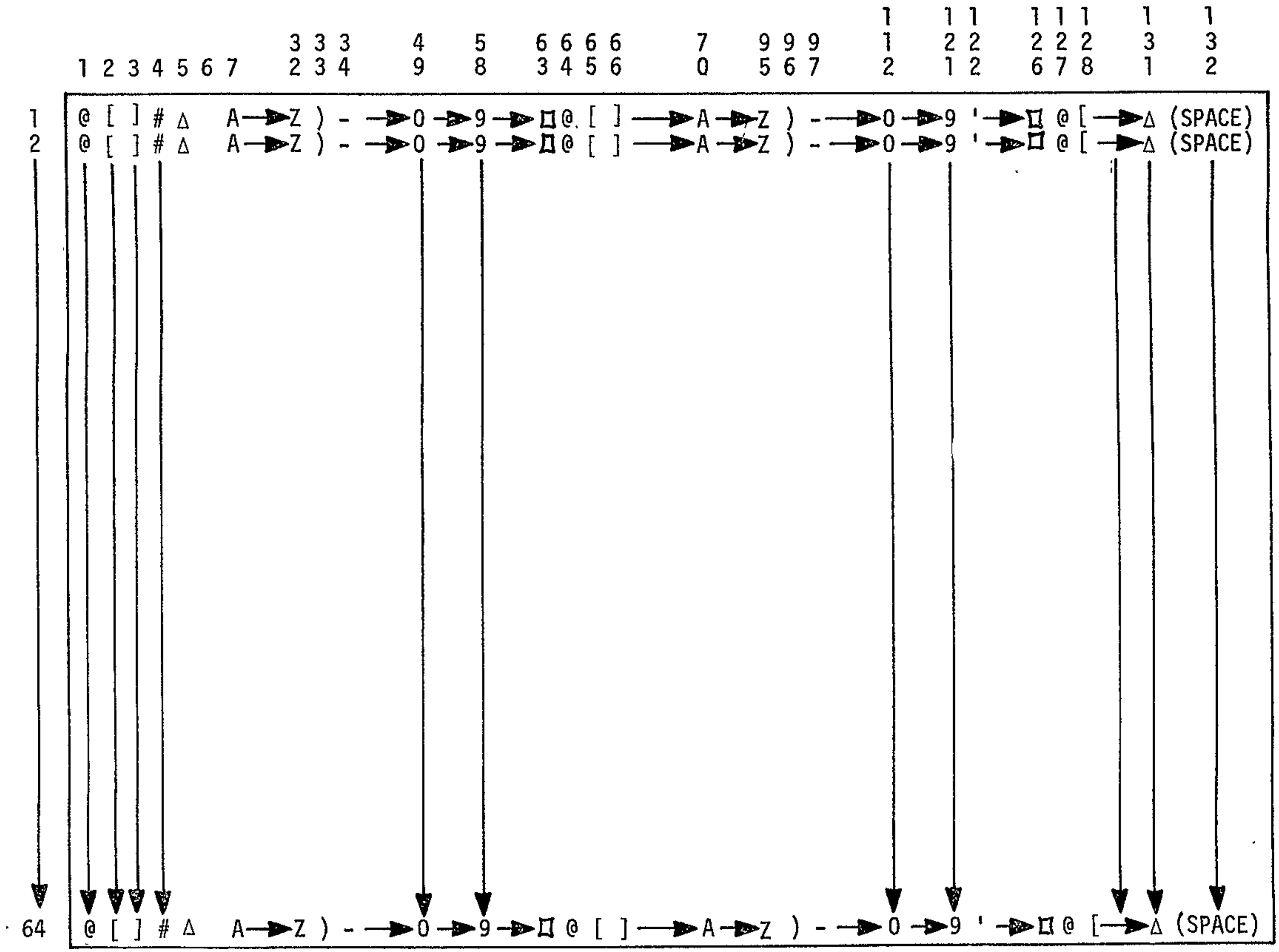

Figure B-13 (Cont'd)

TABLE B-19

94U105 TESTS

JOB/TAPE NO. & JOB NAME	PURPOSE	CONTENT/FORMAT
1/1 COMA 1	TEST COMA'S ABILITY TO GENERATE CHARACTER REPERTOIRE AND MAXIMUM CHAR/LINE/PAGE	GENERATE FULL PAGES (64 LINES OF 32 CHARACTERS EACH) CONTAINING ALL POSSIBLE CHARACTER CODES. DATA PAGES SHALL BE CONSTRUCTED AS ILLUSTRATED IN FIGURE B-8 AND THESE TWO PATTERNS SHALL BE ALTERNATED PER FRAME.
	TEST COMA'S ABILITY TO HANDLE TEST DATA OVERFLOW FROM FICHE TO FICHE	GENERATE SUFFICIENT DATA (4000 DATA BLOCKS) TO PRODUCE MORE THAN ONE FICHE.
	TEST FIVE DIFFERENT FORMS AND INDEXING FOR FULL PAGES AND FULL MICROFICHE	GENERATE A CONTROL RECORD FOR FORMS OVERLAY AND INDEXING. THIS RECORD SHALL PRECEDE EVERY 64 DATA RECORDS. THE FORMS OVERLAY RECORDS SHALL OCCUR IN THE FOLLOWING ORDER: • BLANK FORM • A BOX ENCLOSING THE 11 x 14 PRINTER PAGE • 65 LINES • A BOX ENCLOSING THE 11 x 14 PRINTER PAGE WITH 65 LINES • A BOX ENCLOSING THE 11 x 14 PRINTER PAGE WITH 65 HORIZONTAL LINES AND 132 VERTICAL LINES THE INDEXING VALUES SHALL VARY ON EACH OF THE FORM CONTROL RECORDS.
2/1 & 2 COMA 2	TEST JOB SEPARATOR CONTROL RECORD	GENERATE A JOB SEPARATOR CONTROL RECORD BETWEEN JOBS 1 AND 2.
	TEST MULTIREEL/JOB AND MULTIREEL/PAGE	1600 PHYSICAL BLOCKS OF DATA TO PRODUCE A PATTERN AS ILLUSTRATED IN FIGURE B-13 SHALL BE GENERATED FOR THIS JOB; 382 PHYSICAL BLOCKS OF DATA SHALL BE GENERATED ON TAPE 1 AND THE REMAINING DATA SHALL BE PLACED ON TAPE 2. A FORMS OVERLAY RECORD SHALL PRECEDE EVERY 64 DATA RECORDS.

TABLE B-19 (CONT'D)

JOB/TAPE NO. & JOB NAME	PURPOSE	CONTENT/FORMAT
3/2 COMA 3	CARRIAGE CONTROL TEST CHECKS: COUNT = 77_8 AND LAST LINE PLUS COUNT $\geq 77_8$	IN ADDITION TO THE CONTROL RECORDS, GENERATE 1024 LOGICAL RECORDS OF DATA. DATA SHALL BE CONSTRUCTED AS ILLUSTRATED IN FIGURE B-13. THE LINE SPACING COUNT (BYTE 135_8) OF EVERY 32ND RECORD SHALL BE A NUMBER 32_{10} OR GREATER. THE LINE SPACING COUNT ON ALL OTHER RECORDS SHALL BE A 0.
	TEST ABSENCES OF THE FORM AND INDEX CONTROL RECORD	NO FORM & INDEX RECORD SHALL BE GENERATED PRIOR TO THE DATA RECORDS.
4/2 COMA 4	TEST COMIC MODE CONTROL RECORD FOR BOTH 16 MM AND 105 MM FILM	GENERATE A COMIC MODE CONTROL RECORD FOLLOWING THE JOB SEPARATOR, THE TITLING, AND THE FORMS AND INDEXING CONTROL RECORDS; 192 LOGICAL RECORDS OF DATA SHALL BE GENERATED.
5/6 COMA 5	TEST CINE MODE CONTROL RECORD FOR 16 MM FILM	GENERATE A CINE MODE CONTROL RECORD FOLLOWING THE JOB SEPARATOR, TITLING, AND FORMS AND INDEXING CONTROL RECORDS; 192 LOGICAL RECORDS OF DATA SHALL BE GENERATED.

TABLE B-20

USERS FICHE TITLES

JOB NO.	TAPE NO.	USERS TITLE
1	1	UNIVAC 494 MULTI-FICHE TEST
2	1-2	UNIVAC 494 MULTIREEL TEST
3	2	UNIVAC 494 CARRIAGE CONTROL TEST
4	2	UNIVAC 494 COMIC MODE TEST
5	2	UNIVAC 494 CINE MODE TEST

B.12 COMA UNIVAC 494 PRINT PROCESSOR FOR 16 mm FILM (94UV16)

See paragraph 2.2. Revisions are as follows:

Date	Author	EO/TPS No.
6 November 1973	I. J. Morgan	EO-204F - TPS A18

TPS No. A18 follows. See also paragraphs B.12.1 through B12.5, figure B-14, and tables B-21 and B-22.

1. TYPE: A Configuration Change / B Non-Configuration Change	**TEST PREPARATION SHEET** NASA - MANNED SPACECRAFT CENTER	2. TPS No	E.O. 204F A18
4 Mod Sheet Number		3 S/C	Cat. / No
		5 Page 1 of 3	
6. S/C No / Model No	7 Date / 8 Time	9. Need Date	
10 Drawings, Documents, Ocps. & Part Number(s)		11. Contract Number NAS 9-1261	
		12 Serial Number	
13 System COMPUTER ON MICROFILM		14 Ref E O Number 204F	
15 TPS Short Title UNIVAC 494 SOFTWARE ACCEPTANCE TEST FOR THE 16mm FILM		16 Wt. Req	

17. Reason for Work To verify the software development on the COMA System for the UNIVAC 494 Print Processor as defined in PHO SH-09846 and as required under E.O. 204F.

	18 DESCRIPTION (Print or Type)	21. Tech.	Insp 22 CONT	23 NASA
	1. Univac 494 Print Processor Acceptance Test - Tape 1			
	a. At the Tape Transport (7-track unit)			
	(1) Mount Univac 494 Acceptance Test Tape 1.			
	b. At the Teletype:			
	(1) Type PRO;94UV16$J to load the Univac 494			
	16mm program. Verify that *Monitor is typed			
	on the teletype.			
	(2) Type CLEAR/↲ twice to advance exposed film			
	into the take-up magazine. Verify that *OK			
	is typed on the teletype after each CLEAR/↲			
	(3) Type GO/↲ to initiate processing of Univac			
	494 Acceptance Test Tape (Tape 1). Verify			
	that the starting time and frame number are			
	typed on the teletype.			
	(4) Verify that the elapsed job time, frame			
	number, page number and *END OF FILE are			
	typed on the teletype to signal completion			
	of data tape processing.			

19 Prepared By R. A. MARKS		20 Final Acceptance Date	
REFER TO PROCEDURES FOR REQUIRED SIGNATURES		REFER TO PROCEDURES FOR REQUIRED SIGNATURES	
Contractor	Date	NASA	Date

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TPS No E.O. 204F A18
S/C | Cat. | No
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	DESCRIPTION (Print or Type)	Tech	Insp Cont	Insp NASA
	(5) Type REWIND/2 to rewind the Univac Test Tape			
	(Tape 1). Verify that *OK is typed on the			
	teletype.			
	c. At the Tape Transport			
	(1) Dismount the Univac 494 Print Acceptance			
	Test Tape (Tape 1).			
	2. Univac 494 Print Acceptance Test Tape 2			
	(Continuation of Job 2 from Tape 1)			
	a. At the Tape Transport:			
	(1) Mount the Univac 494 Test Tape 2.			
	b. At the Teletype:			
	(1) Type CONTINUE/2 to signify continuation			
	of Job.			
	(2) Verify that the elapsed job time, frame			
	number, page number and *END OF FILE are			
	typed on the teletype to signal completion			
	of data tape processing.			
	(3) Type END JOB/2 to complete processing of			
	the Univac 494 Test Tape (Tape 2).			
	(4) Type CLEAR/2 twice to advance exposed film			
	into the take-up magazines. Verify that			
	*OK is typed on the teletype after each			
	CLEAR/2 .			
	(5) Type REWIND/2 to rewind the Univac 494			
	Print Acceptance Test Tape (Tape 2). Verify			
	that *OK is typed on the teletype.			
	c. At the Tape Transport:			
	(1) Dismount the Univac 494 Print Acceptance			
	Test Tape (Tape 2).			

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S/C	Cat.	No
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	DESCRIPTION (Print or Type)	Tech	Insp Cont	Insp NASA
	d. Test Result Verification:			
	(1) Process 16mm film containing results.			
	(2) View the resulting 16mm film on the viewer.			
	Verify that the results match the Jobs as			
	described in the following paragraphs.			

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Copy 1

B.12.1 Job 1, Multifiche Test. This job is contained in its entirety on tape 1. It contains data to build in excess of 207 full pages (64 lines of 132 alphanumeric characters each). Data pages are constructed as illustrated in figure B-14, with the first and second pages of that figure alternating. A control record for forms overlay precedes every 64 data records, causing each of the forms to be generated once every fifth page. This job will demonstrate maximum page size, complete character repertoire, and the five forms. See table B-21.

B.12.2 Job 2, Multireel Test. This job begins on test tape 1 and continues to test tape 2. A job separator control record separates jobs 1 and 2. Sixteen hundred physical blocks of data, to produce full pages as illustrated in figure B-14, are generated. Only 382 physical blocks of data are contained on test tape 1, and it is followed by Univac's standard end-of-file as defined in the Univac 494 Uniservo VIII C Magnetic Tape Subsystem. The remaining data is on test tape 2. A control record for forms overlay precedes every 64 data records. The form number (as specified for job 1) varies from one record to another. Job 2 demonstrates the COMA's ability to handle multireels per job and multireels per page. See table B-21.

B.12.3 Job 3, Carriage Control Test. A job separator control record separates jobs 2 and 3. It is followed by 1024 logical records of data. The data pages are constructed as illustrated in figure B-14. The line spacing count (byte 135_{10}) of the 32nd data record contains 77_8. This causes 32 lines of data to appear on the first page (frame). The line spacing count on all other records of data contains a zero, with the exception of every 64th record after the 32nd record. Every 64th record contains a 77_8 line count. A forms and index control record shall not be present. This job shows COMA's ability to properly process the line spacing count, and its ability to handle the absences of forms and index control record. See table B-21.

B.12.4 Job 4, COMIC Mode Test. A job separator record, title control record, form and indexing control record, and an image orientation control record precedes the data records. The image orientation control record indicates COMIC mode; i.e., a 1 follows the I as specified in the *Computer Output Microfilm System A UNIVAC 494 Print Processing Requirements Specification.* The data records are constructed to produce three full pages of data. The forms control record is set to a 4 without indexing. This job tests COMA's ability to generate the COMIC mode. See table B-21.

B.12.5 Job 5, CINE Mode Test. A job separator record, title control record, forms and indexing control record, and an image orientation control record precedes the data records. The image orientation control record shall indicate CINE mode; i.e., a 2 follows the I as specified in the *Computer Output Microfilm System A UNIVAC 494 Print Processing Requirements Specification.* The data records are constructed to produce a pattern as illustrated in figure B-14. One hundred ninety-two logical records of data are generated to produce three full pages of data. The forms record is set to a 4 without indexing. This data is followed by by an end-of-file, end-of-tape control record. This job illustrates COMA's ability to handle the CLINE mode and to recognize the end-of-file, end-of-tape as the last job to be processed from this tape. The end-of-file, end-of-tape control record is followed by Univac's standard end-of-file as defined in the Univac 494 Uniservo VIII C Magnetic Tape Subsystem. See table B-21.

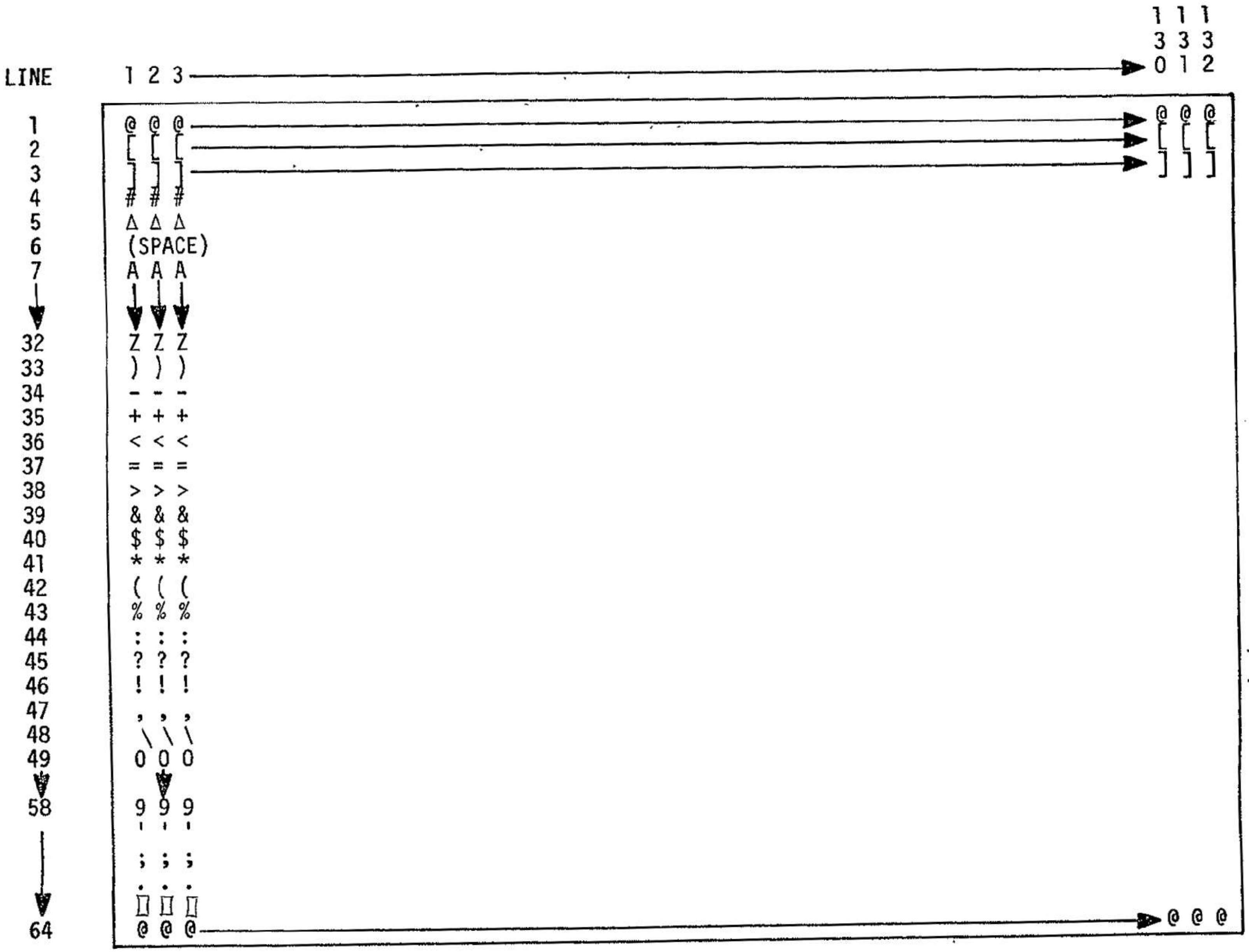

Figure B-14 Alphanumeric Data (64 Lines of 132 characters)

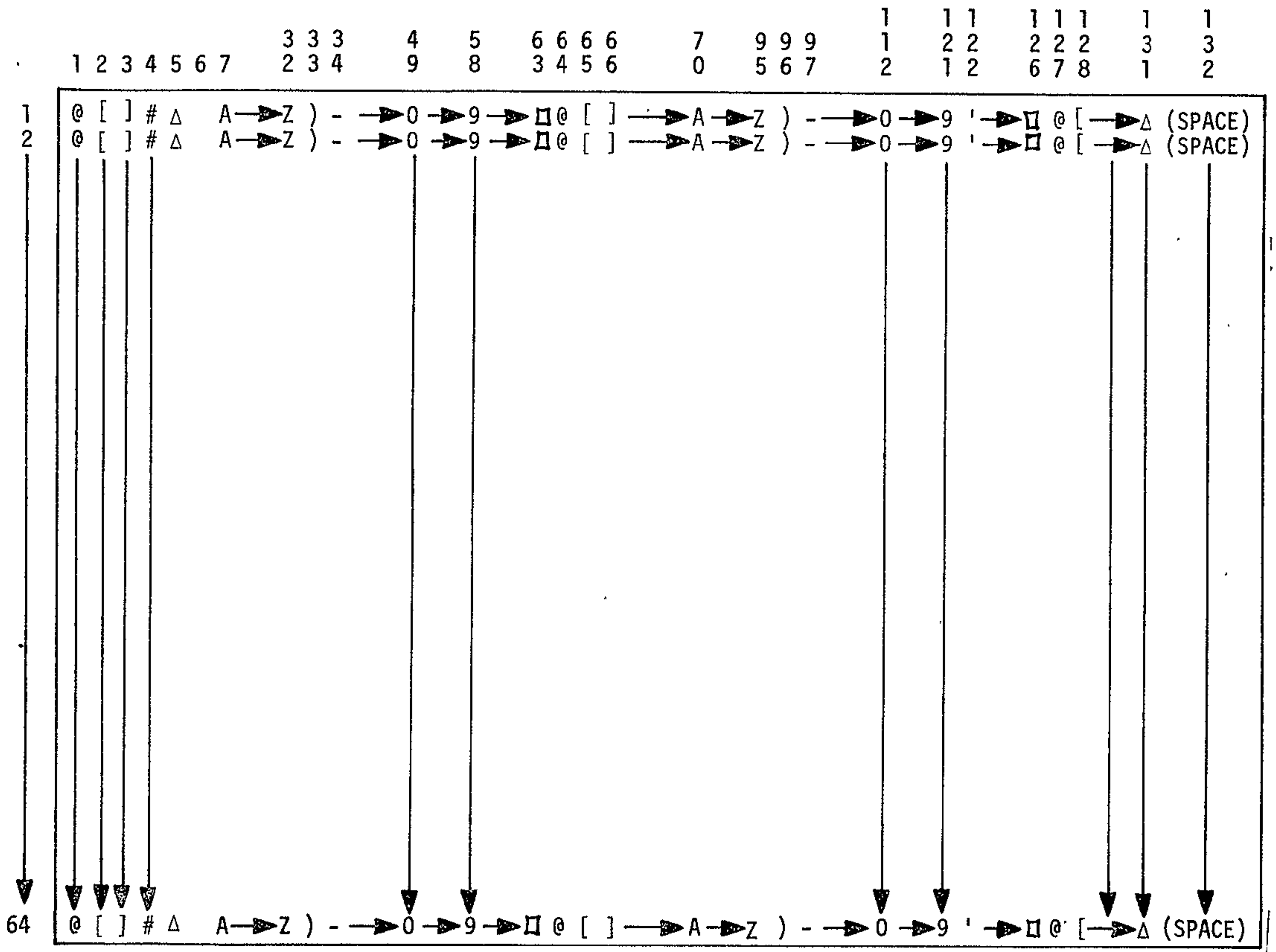

Figure B-14 (Cont'd)

TABLE B-21
94UV16 TESTS

JOB/TAPE NO. & JOB NAME	PURPOSE	FORMAT/CONTENT
1/1 COMA 1	TEST COMA'S ABILITY TO GENERATE CHARACTER REPERTOIRE AND MAXIMUM CHAR/LINE/PAGE	GENERATE FULL PAGE (64 LINES OF 132 CHARACTERS EACH) CONTAINING ALL POSSIBLE CHARACTER CODES. DATA PAGES ARE CONSTRUCTED AS ILLUSTRATED IN FIGURE B-14 AND THESE TWO PATTERNS ARE ALTERNATED PER FRAME.
	TEST FIVE DIFFERENT FORMS AND INDEXING FOR FULL PAGES	GENERATE A CONTROL RECORD FOR FORMS OVERLAY AND INDEXING. THIS RECORD PRECEDES EVERY 64 DATA RECORDS. THE FORMS OVERLAY RECORDS OCCUR IN THE FOLLOWING ORDER: • BLANK FORM • A BOX ENCLOSING THE 11 x 14 PRINTER PAGE • 65 LINES • A BOX ENCLOSING THE 11 x 14 PRINTER PAGE WITH 65 LINES • A BOX ENCLOSING THE 11 x 14 PRINTER PAGE WITH 65 HORIZONTAL LINES AND 132 VERICAL LINES. THE INDEXING VALUES VARY ON EACH OF THE FORM CONTROL RECORDS.
2/1 & 2 COMA 2	TEST JOB SEPARATOR CONTROL RECORD	GENERATE A JOB SEPARATOR CONTROL RECORD BETWEEN JOBS 1 AND 2.
	TEST MULTIREELS PER JOB AND MULTIREELS PER PAGE	1600 PHYSICAL BLOCKS OF DATA TO PRODUCE A PATTERN AS ILLUSTRATED IN FIGURE B-14 ARE GENERATED FOR THIS JOB. 382 PHYSICAL BLOCKS OF DATA ARE GENERATED ON TAPE 1 AND THE REMAINING DATA IS PLACED ON TAPE 2. A FORMS OVERLAY RECORD PRECEDES EVERY 64 DATA RECORDS.

TABLE B-21 (CONT'D)

JOB/TAPE NO. & JOB NAME	PURPOSE	FORMAT/CONTENT
3/2 COMA 3	CARRIAGE CONTROL TEST CHECKS: COUNT = 77_8 AND LAST LINE PLUS COUNT $\geq 77_8$	IN ADDITION TO THE CONTROL RECORDS, GENERATE 1024 LOGICAL RECORDS OF DATA. DATA CONSTRUCTED AS ILLUSTRATED IN FIGURE B-14. PAGES OF DATA ARE GENERATED.
	TEST ABSENCES OF FORM AND INDEX CONTROL RECORD	NO FORM AND INDEX RECORD SHALL BE GENERATED PRIOR TO THE DATA RECORDS.
4/2 COMA 4	TEST COMIC MODE CONTROL RECORD FOR BOTH 16 MM AND 105 MM FILM	GENERATE A COMIC MODE CONTROL RECORD FOLLOWING THE JOB SEPARATOR, THE TITLING, AND THE FORMS AND INDEXING CONTROL RECORDS; 192 LOGICAL RECORDS OF DATA SHALL BE GENERATED.
4/6 COMA 5	TEST CINE MODE CONTROL RECORD FOR 16 MM FILM	GENERATE A CINE MODE CONTROL RECORD FOLLOWING THE JOB SEPARATOR, THE TITLING, AND THE FORMS AND INDEXING CONTROL RECORDS; 192 LOGICAL RECORDS OF DATA ARE GENERATED.

TABLE B-22
USERS FICHE TITLES

JOB NO.	TAPE NO.	USERS TITLE
1	1	UNIVAC 494 MULTI-FICHE TEST
2	1-2	UNIVAC 494 MULTIREEL TEST
3	2	UNIVAC 494 CARRIAGE CONTROL TEST
4	2	UNIVAC 494 COMIC MODE TEST
5	2	UNIVAC 494 CINE MODE TEST

B.13 COMA LACIE STATUS MODULE (PFC, COMA)

See paragraph 2.13. Revisions are as follows.

Date	Author	TPS No.
3 April 1975	J. E. Bennett	TPS A16

See paragraph B.15 for TPS A16.

B.14 COMA LACIE STATUS DISPLAY (REVEAL)

See paragraph 2.14. Revisions are as follows:

Date	Author	TPS No.
28 May 1975	J. E. Bennett	TPS A15

TPS A15 follows.

1 TYPE: A Configuration Change / B Non-Configuration Change	**TEST PREPARATION SHEET** NASA - MANNED SPACECRAFT CENTER	2. TPS No. A15	3. S/C Cat. No
4. Mod. Sheet Number		5 Page 1 of 1	
6 S C No Model No.	7 Date	8 Time	9 Need Date
10 Drawings, Documents, Ocp's & Part Number(s)			11 Contract Number
			12 Serial Number
13 System COMA			14 Ref E O Number TIRF #1700
15 TPS Short Title			16 Wt. Req
17 Reason for Work: VERIFICATION OF REVEAL PROGRAM			

18 DESCRIPTION (Print or Type)	21 Tech	Insp 22 CONT	23 NASA
I. TESTS			
A. At the teletype; enter REVEAL$J.			✓
B. Verify that *MONITOR is typed by program.			
C. Enter REVEAL STATUS BLOCKS/(CR)			✓
II. VERIFICATION			
A. Verify that the data displayed by the program is the same as the printout from R.T.O.S.			✓

19 Prepared By		20 Final Acceptance Date	
REFER TO PROCEDURES FOR REQUIRED SIGNATURES		REFER TO PROCEDURES FOR REQUIRED SIGNATURES	
Contractor	Date	NASA	Date
Jack C. Barnett	5/28/75	F. S. Jones	5/28/75

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B.15 COMA LACIE PRINT PROCESSOR FOR 105 mm FICHE (LACPRT)

See paragraph 2.15. Revisions are as follows:

Date	Author	TPS No.
3 April 1975	F. C. Ashton	Original TPS A16
20 October 1975	J. Gummelt	TPS A20

TPS A16 and A20 follow.

TYPE: A Configuration Change / B Non-Configuration Change	**TEST PREPARATION SHEET** NASA - MANNED SPACECRAFT CENTER	2 TPS No A16
4 Mod Sheet Number		3 S.C Cat No
		5. Page 1 of 4
6 S C No Model No	7. Date / 8 Time	9 Need Date April 4, 1975
10 Drawings, Documents, Ocp's & Part Number(s)		11. Contract Number
		12 Serial Number
13 System FR-80 MICROFILM SYSTEM (COM-A)		14 Ref E O Number TIRF #2751
15 TPS Short Title LACIE PRINT PROGRAM		16 Wt Req

17 Reason for Work TO VERIFY THE NEW LACIE PRINT PROGRAM WITH STATUS TAPE FOR THE COM-A

18 DESCRIPTION (Print or Type)	21 Tech	Insp. 22 CONT	23 NASA
TEST TAPE			
The Test Tapes are furnished by IBM LACIE Group.			
Test File 1 - Reel 14360			
Single Reel with 6 Title Records.			
Test File 2 - Reels 917 and 13067			
Two Reel File containing three Title Records			
with indexing.			
1. Base Line Single Reel File			
Program PRO;105PR$J			
FRAMES 7 PAGE 147 TIME			
2. Base Line Multi-Reel File Program PRO;105PR$J			
Tapes 917, 13067			
FRAMES 6 PAGES 366 TIME			
3. New Program Single Reel File			
Program FCA;LACPRT$J			
Tape 14360			
Type In: Julian Data 75095			
: Tape Number A14360			

19 Prepared By		20 Final Acceptance Date	
REFER TO PROCEDURES FOR REQUIRED SIGNATURES		REFER TO PROCEDURES FOR REQUIRED SIGNATURES	
Contractor	Date	NASA	Date
[illegible signature]	4/3/75	[illegible signature]	4/3/75

FRAMES 7 PAGES 147 TIME ______

4. New Program Multi-File

Program FCA;LACPRT$J

Tape 917, 13067

Type In: Julian Data 75095
Tape Number A917
Continue
Tape Number A13067

FRAME 6 PAGE 366 TIME ______

5. New Program Single Title

Program FCA:LACPRT$J

Type In: Search Title /1, 1
Julian Data 75095
Tape Number B13067

FRAME 2 PAGE 123 TIME 1.31

6. New Program Unlabeled

Program FCA;LACPRT$J

Tapes 917, 13067

Type In: Unlabeled
SKP
Julian Data 75095
Tape Number C917
Rewind
Continue
Tape Number C13067

FRAMES 6 PAGE 366 TIME ______

7. New Program Read Error

Program FCA;LACPRT$J

Tape 14360

Type In: Julian Date 75095
Tape Number B14360
Continue
(After Forced Read Error)

Next Title
(After CNTR I) 133
FRAME 7 PAGE ~~40~~ TIME 1.36

8. New Program Termination Due to Error
Program FCA;LACPRT$J
Tape 14360

Type In: Julian Date 75095
Tape Number C14360
Termination Due to Error
(After CNTL I)
Dump Status Tape
(After Load Tape)

9. Status Tape Verification
Program M$J
Type In 9BETR

10. New Program - No Status
Program FCA;LACPRT$J
Tape Number 14360

Type In: Status Job/1
Julian Date 75095
Tape Number D14360
Dump Status Tape
(After Load Tape)

FRAMES 5 PAGE 105 TIME 2.58

11. No Status Verification
Program M$J

12. New Program - Wipe Status Black
Program FCA;LACPRT$J
TAPE 14360

Type In: Julian Data 75095
Tape Number E14360
Dump Status Tape
(After Load Tape)

13. Verify Status Block Cleared

    Program M$J

14. Process Film and Verify Data Content, Titles Processed and Indexing.

TEST PREPARATION SHEET

NASA - LYNDON B. JOHNSON SPACE CENTER

1. TYPE: A Configuration Change / B Non-Configuration Change

2 TPS No. ~~A19~~ A20

3 S/C — Cat — No.

4 Mod Sheet Number

5. Page 1 of 2

6 S/C No /Model No

7 Date October 20, 1975

8. Time

9 Need Date

10. Drawings, Documents, Ocp's, & Part Number(s)

11. Contract Number

12 Serial Number

13 System COMA

14 Ref E O Number TIRF 1701

15. TPS Short Title LACIE Print - Julian Date Calculation

16 Wt Req

17. Reason for Work To verify validity of software developed to allow calculation of Julian Date from input calendar date. Previously the Julian date had to be input directly.

18 DESCRIPTION (Print or Type)	21. Tech	22 CONT	23 NASA
TESTS			
1. GENERAL			
1.1 Tape Input. This tape is a LACIE Print Tape.			
1.2 Teletype Input. Date to be converted will be entered from teletype.			
1.3 Film. 105mm Film will be output.			
1.4 Status Tables. Tables containing information on files statused will be displayed on the monitor.			
2. TEST PROCEDURES			
A. Normal Operation			
1. Mount program tape on 9-track drive.			✓
2. Type D$J on teletype.			✓
3. Type R$J on teletype.			✓
4. Type WIPE ↲ on teletype.			✓
5. Type ALL ↲ on teletype. Programs to be used will be read into core.			✓
6. Mount LACIE print tape on 9-track drive.			✓

19 Prepared By Jim Gummelt

20 Final Acceptance Date

REFER TO PROCEDURES FOR REQUIRED SIGNATURES

Contractor	Date	NASA	Date
Jim Gummelt	10/20/75	E. Jones	10/20/75

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END
DATE
4,27,76

TEST . .EPARATION SHEET

CONTINUATION SHEET

NASA – LYNDON B. JOHNSON SPACE CENTER

TPS No. ~~A19~~ A20

S/C | Cat. | No.

Page 2 of 2

	DESCRIPTION (Print or Type)	Tech.	Insp. Cont.	Insp. NASA
7.	Type FCA;LACPRT$J. Monitor will display run options.			✓
8.	Type GO/↵ .			✓
9.	Teletype will print: ENTER DATE			✓
10.	Type today's date in the form MM/DD/YY.			✓
11.	Teletype will print ENTER TAPE NUMBER.			✓
12.	Type tape number 13731↵. Print tape will begin processing with frames displayed on monitor.			✓
13.	Type Control A. Processing will halt when a complete page is done.			✓
14.	Type TERM/↵.			✓
15.	Type CL/↵ twice.			✓
16.	Type Control D.			✓
17.	Type REVEAL$J.			✓
18.	Type REV/↵ . Monitor will display status tables with Julian date.			✓
19.	Film (1 fiche) will reflect accurate information.			✓

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